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CENTRAL STATION BOOKKEEPING

AND

SUGGESTED FORMS

WITH AN APPENDIX

FOR

STREET RAILWAYS.

BY

HORATIO A. FOSTER,

Mem. Am. Inst. E.E.



NEW YORK

THE W. J. JOHNSTON COMPANY

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PREFACE.

IN placing this book before the electrical public the author has endeavored to show a classification of accounts and a system of reports for central electric light and power stations such that the management may by their use know the full details of the business of distributing electric current. Companies are not by any means advised to throw away all their present reports and take this system up bodily and try to fit the station to it; but the management can, by ~~studying~~ studying the needs of the particular station and the forms herein, select such reports as may fit, and from the data furnished compile others for special points. But few of the forms have been printed in actual size, as each manager should be able to decide on the size of blank best fitted for his own station: sizes such as have been found convenient in actual use are stated in the foot-notes accompanying the forms, but these sizes can be varied to suit.

The author desires to thank the many managers and superintendents with whom he has consulted, for their unvarying kindness in supplying him with copies of blanks used by themselves, and for the many practical suggestions offered.

HORATIO A. FOSTER.

NEW YORK, July 15, 1894.



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CENTRAL STATION BOOKKEEPING

AND

SUGGESTED FORMS.

CHAPTER I.

INTRODUCTION.

ABOUT two years ago the writer published a short series of articles on records and blanks for use in Electrical Lighting Central Stations in the *Electrical Engineer* under the name of "Central Station Management and Finance." The articles being somewhat new at the time seemed so well thought of that they were published in book form. These articles were very crude; the forms lacked many features necessary or convenient and were not carried nearly far enough to cover the ground.

Since those articles were written, having made personal examination of some 160 different stations both technically and financially for the United States Census, the writer thinks the subject can be covered much more fully, and in the light of past experience has attempted to outline and suggest methods and forms for use in such places, which, while not claiming to be perfect, contain the general outline of a classification, scheme of analysis, and forms of books and blank reports which may be of use in developing a system for any station. No claim is made for entire originality, as many of the forms are but slight modifications of those used by companies already existing.

The need of some system of records and accounts can scarcely be overestimated, very few stations keeping any kind of record outside the regular books, and these are often so few and poorly kept as to be of no use. Very few stations are in shape to know

the unit costs of supplying electric current, and for this reason are very weak when attacked by parties having in tow some scheme for municipal lighting. The few municipal stations examined by the writer have been, contrary to all theory, much better handled than similar ones of private corporations, and the accounts have been in most cases very well kept.

Some few managers say that they are satisfied if their balance is on the right side of Profit and Loss, and need no reports: of course that is a fallacy too obvious to need argument.

By far the larger number express great interest and welcome any information looking to a proper system of reports, but in many cases seem to think that it will require too much time. For these it can be said that after the few blanks necessary in the smaller stations are properly placed and understood—and that is an easy matter—the employés will be found not only willing but interested to fill them out properly, as, many times, reference to them will settle troublesome disputes. It is a matter for congratulation that the parties most interested are working up these facts and in the near future things will begin to shape themselves so that the question of comparative and total cost may be better understood.

We are sometimes disposed to think that our friends the gas companies are in better shape in regard to records and reports than we, but it is assured on the authority of some of the best-posted gas-engineers in the country that to a very great extent such is not the case, and when electric lighting was taken up by them, the work having been forced on them to avoid competition, it was not with the best grace, and in many cases it was allowed to become a secondary portion of their business and they avoided all data that would be troublesome.

It must be admitted that where gas companies have made any attempt to systematize their work—and that is in much larger proportionate numbers than in the electrical business—they have the detail in much better shape and can give not only the actual cost per unit of production but cost per unit for any department of the work.

The secretary of one of the largest gas companies in the country, one that takes the deepest interest in any data tending to show more accurate costs, informed the writer that the Gas Association has for many years been trying to have the companies adopt a uniform system of accounts, but has been unable

to accomplish that result as their bookkeepers have become old and conservative in the business and will not take up with the newfangled notions. If this is so in the older business of gas-making, which has advanced a long way toward system, it is perhaps only natural that backwardness should be expected so early in the newer business of electrical distribution.

The writer, although somewhat prepared by previous experience, has been surprised at the rather crude attempts at book-keeping, and still more surprised at the great interest shown by the accountants in getting a system that would be of some use to show results better. Most of these men have ideas of their own on the subject, but are somewhat backward about advancing them, for fear they may not, from lack of technical knowledge, cover the field well enough.

Occasionally one runs across a book perfectly startling in its comprehensiveness, say in the department of customers' accounts; but on following up this clue it is generally found that the other books adhere to no settled method and therefore lack the best results.

Massachusetts, through a gas commission, has succeeded to a very great extent in regulating and standardizing the accounts of both gas and electric companies, exacting a penalty for delays, and has developed a very fine system of analysis and record. As yet the commission has not seen fit to enforce the rule as to a report on the output of the stations—therefore unit costs cannot be calculated; this will doubtless be the next step, and will be of the very greatest value.

Although much in the following chapters relates to the details of double-entry bookkeeping, no effort has been made to enter into a detailed treatise on the subject, as a substantial knowledge of its principles is presupposed, and no one should attempt to take up this work without such knowledge.

CHAPTER II.

CUSTOMERS' LEDGERS.

IN the chapters on "Suggested Forms" the records have been brought up through the contract, installation, meter-reading, and first entry of arc-lamp service, and forms are also shown for billing the charge to the customer.

The next step is the record of this charge and shaping it for future use. It is simply impossible to devise a form of customers' ledger that will satisfy all, so the writer has shown with this department several designs that are in many ways like the better class of those now in use, and especially the forms which approach most nearly to those for a long time in successful use by the better class of gas companies.

Many companies favor a customers' ledger after the style used for so long as a business ledger, in which each person's account is kept on a page by itself; for the benefit of these, forms Nos. 52 and 53 have been selected. The former is for a lighting ledger on a contract basis and the latter on a meter basis of charge.

In Form No. 52 the name and address are put at the top of the page, followed by smaller headings for such detail of the contract as has been found desirable to keep in sight. The contract number, date it expires; a concise statement of the equipment connected, giving the number of arc-lamps, the number of each candle-power of the incandescent lamps, the number of motors and horse-power of each, the number of nights per week in which the installation is to be run, especially relating to arc-lamps and motors, and the hours of the day during which current is to be supplied, are all good data to have always before one.

On the debit side of the page the date column takes the day the charge is made and should be the last day of the month rather than the first. In the next column, "Nature of Charge," any details may be written, such as the number of lamps burned daily, the number of lamps out, any charge belonging in this

FORM No. 52.
CONTRACT CUSTOMERS' LEDGER.

Name..... Address.....
Contract No. Expires..... Number nights per week run..... Hours, from..... to.....
.....189 . Number lamps connected..... Motors, No. H.P.....

Date,	Nature of Charge.	Rate.	Power.	Arc.	Incandescent.	Amount Due.	Paid.			
							Date.	C.-B. Page.	Amount Paid.	Rebate.

[NOTE.—Convenient size page, 10½ x 16.]

FORM No. 53.
METER CUSTOMERS' LEDGER.

Name..... Address.....
Contract No. Expires..... Number lamps connected..... Motors connected, No. H.P.....

Date.	Number of Meter.	Reading.	Difference.	Factor.	Amount of Units.	Rate.	Amount Due.	Paid.			
								Date.	C.-B. Page.	Amount Paid.	Rebate.

[NOTE.—Convenient size page, 10½ x 16.]

book, such as for lamp renewals, extra charges of any kind, and in fact any detail relating to the business transacted with the customer.

The "Rate" column states the contract rate per unit for the charge, and the amount calculated at this rate for the current furnished for the period is written in one of the next three columns separated into the proper divisions of Power, Arc, Incandescent, the total amount for the month or other period being written in the column "Amount Due."

By dividing the charges into separate columns it is easy to determine the amount of business transacted under each head, and this, taken in connection with the statement of expenses, will show where the gains and losses are.

The credit columns are: one for the date of payment; another for the page of the "Cash-book" from which the payment is entered; another for the amount of cash paid, and next to it a column for the amount of rebate or allowance made at the time of payment. It will be seen that it is necessary to add the last two columns together to balance the amount of the column on the debit side, "Amount Due"; in practice it has been found quite desirable to keep the two items cash and rebate separate for convenience in locating errors and for a proper comparison of rebates.

The Meter Customers' Ledger, Form No. 53, is the same as the above as to headings of the page, excepting the leaving out of the time of burning, this not being necessary in meter service, where the quantity of current supplied is the charge.

On the debit side of the page the date column is used the same as the previous form. The "Number of Meter" should be given when that instrument is first connected as well as the number of any meter that may subsequently be used to replace it, stating the date and recording the dial-reading of both outgoing and incoming meters when changed.

The dial-reading of the meter is entered under its heading at each date, the "Difference" being calculated between the current and previous readings. In case the readings are direct, i.e., in units without factor or multiplier, the amount due may be calculated directly from the "Difference" column at the rate as shown in the "Rate" column, and be written at once into the column of "Amount Due." Should a factor or multiplier be necessary with the meter, as is often the case with the Thomson



recording watt-meter, this factor will be written in the column for that purpose at the same time with the meter number, and the differences will then have to be multiplied by this factor, the result being entered in the column for "Amount of Units."

The credit side of the page is precisely like that of the previous form and will need no further description.

The great fault with this form of book is the necessity of transferring the balances each month to a trial balance-book for proof, which consumes a great deal of time.

For stations having more than two hundred customers the following forms of customers' ledgers will save so much time, be so much more convenient, and allow of so much easier proof of posting, over the forms described above, that it is foolish conservatism not to make the change. Forms similar to those about to be described are in use by many large gas companies, electric-light companies, and in fact a great number of other industries where the entries are periodical.

Form No. 54 is designed for use in smaller stations, but is quite applicable to those of any size.

In this book the customers' names are written in alphabetical order down the left side of the page, the contract number being placed in the column on the margin. The conditions of the contract are next stated, and are the same as the information filled in under the headings of the two previous forms, such as, date it expires; number of lamps and motors connected; the number of days or nights run, and hours of service. Columns then follow for each day of the month, which may be filled with the number of lamps burned, or if such a statement is not necessary perhaps the number of lamps out might be recorded under the proper date.

Meter-readings are written in the column with that heading, and the differences as well as the total arc-lamps or other contract supply are written in the following columns. The rate being stated in the column of "Conditions of Contract," the total units of charge are calculated from the stated rate, and the amount due written in the column with that heading. If any customers are behind in payment, the amount of such delinquency is brought forward from the last column of the previous month, and written in the column next to "Amount Due," called "Delinquent, Last Month." The amount paid and rebate on the bill are both posted from "Cash" into the proper column, the

Date		Description		Amount	
1890	Jan 1	Balance		100.00	
	Feb 1	Interest		5.00	
	Mar 1	Interest		5.00	
	Apr 1	Interest		5.00	
	May 1	Interest		5.00	
	Jun 1	Interest		5.00	
	Jul 1	Interest		5.00	
	Aug 1	Interest		5.00	
	Sep 1	Interest		5.00	
	Oct 1	Interest		5.00	
	Nov 1	Interest		5.00	
	Dec 1	Interest		5.00	
1891	Jan 1	Balance		100.00	
	Feb 1	Interest		5.00	
	Mar 1	Interest		5.00	
	Apr 1	Interest		5.00	
	May 1	Interest		5.00	
	Jun 1	Interest		5.00	
	Jul 1	Interest		5.00	
	Aug 1	Interest		5.00	
	Sep 1	Interest		5.00	
	Oct 1	Interest		5.00	
	Nov 1	Interest		5.00	
	Dec 1	Interest		5.00	
1892	Jan 1	Balance		100.00	
	Feb 1	Interest		5.00	
	Mar 1	Interest		5.00	
	Apr 1	Interest		5.00	
	May 1	Interest		5.00	
	Jun 1	Interest		5.00	
	Jul 1	Interest		5.00	
	Aug 1	Interest		5.00	
	Sep 1	Interest		5.00	
	Oct 1	Interest		5.00	
	Nov 1	Interest		5.00	
	Dec 1	Interest		5.00	
1893	Jan 1	Balance		100.00	
	Feb 1	Interest		5.00	
	Mar 1	Interest		5.00	
	Apr 1	Interest		5.00	
	May 1	Interest		5.00	
	Jun 1	Interest		5.00	
	Jul 1	Interest		5.00	
	Aug 1	Interest		5.00	
	Sep 1	Interest		5.00	
	Oct 1	Interest		5.00	
	Nov 1	Interest		5.00	
	Dec 1	Interest		5.00	

recording watt-meter, this factor will be written in the column for that purpose at the same time with the meter number, and the differences will then have to be multiplied by this factor, the result being entered in the column for "Amount of Units."

The credit side of the page is precisely like that of the previous form and will need no further description.

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date and cash-book page of all payments are entered in the next column, and the last column shown is filled by the amounts remaining due at the end of the month.

It will be noticed that there are five rulings opposite each name: these are for use in case the customer's bill has to be rendered weekly, in which case the first line will be used for the first week or part of week, the second for the second week, the third for the third, and so on. This leaves the monthly totals in good shape. It is unnecessary to write the names more than once in from three to six months, as the right-hand leaf can be clipped off at the vertical line, so that the old names will do for the new pages.

The book should be divided into two departments, one for arc-lighting, the other for incandescent lighting and perhaps power; or, better still, separate books can be provided for the different departments.

The points of value in this book are, that the footings of the columns "Amount Due" and "Delinquent, Last Month" show the total outstanding accounts and must agree with the balance of "Customers' Account" in the general ledger; the sum of the footings of "Amount Paid" and "Rebate" must agree and balance with the like columns in the cash-book; and the footing of the two last, together with the footing of the last delinquent column, must balance the sum of the "Amount Due" plus the "Delinquent, Last Month" column. It will be seen that the book proves itself, proves the cash posting, and acts as trial balance in connection with the general ledger, without other labor than adding up the columns.

Carrying out the same idea as the above book, Form No. 55 has been devised for larger stations for customers on a contract basis; the first three-quarters of the first page is quite similar to the previous form, with the exception of leaving out the daily columns and the meter-reading column. This book will be found very convenient, and one writing of the customer's name is all that is required for the year, as the months follow each other in succession across the first pages to the end of the clipped leaf, and the transfer is made to the *right* of the next leaf instead of to the left of the next page as is usual; this is done to save chance of error in transfer of any amounts, as the lines are all in plain sight. Each month of this book is self-proving, proves the cash posting, and is a trial balance in itself: it is

CUSTOMER'S

NAME.

NUM

Amounts brought forward, - - - - - - -

1

2

Amounts carried forward, - - - - - -

Month of MAY.

[illegible]

2

Month of FEBRUARY.

ONT

ER.

[illegible]

Month of MAY.

[illegible]

[illegible]

12

11

10

[illegible]

ONT

ER.

1880

1880

1880

1880

1

2

1880

1880

2.

[illegible]



Month of JUNE.

6

[illegible]

METER CUSTOMER'S REGISTER.

CUSTOMER'S NAME.	CONTRACT.	NUMBER OF LAMPS OR MOTORS WIRED.					DELINQUENT.	PREVIOUS READING.	Month of JANUARY.						Month of FEBRUARY.											
		NUMBER.	DATE EXPIRES.	C. P. 10	C. P. 16	C. P. 20	C. P. 25	C. P. 32	RATE PER HOUR.	METER NUMBER.	Factor.	FROM OLD BOOK.	METER READING.	DIFFERENCE.	AMOUNT DUE.	C. B. PAGE.	AMOUNT PAID.	REBATE.	DELINQUENT.	METER READING.	DIFFERENCE.	AMOUNT DUE.	C. B. PAGE.	AMOUNT PAID.	REBATE.	DELINQUENT.
Amounts brought forward,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1																										
2																										
Amounts carried forward,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



by far the most convenient book to use of any the writer has ever examined.

Form No. 56 is the Customers' Register for Meter Customers; it has the monthly columns so arranged as to permit of meter-readings and calculations, and in addition includes, in the contract space, columns for the different sizes of incandescent lamps connected, so that the exact number of lamps connected may be calculated at any time. The "Rate per — Hour" means per watt-hour, per ampere-hour, or any like unit that is used. Columns for the meter number and factor or multiplier are also supplied. This book is subject to the same routine and convenience as the Contract Customers' Register, and like it is good for a year for each customer. The credit columns are just like those in the previous books, and will require no explanation. In using this book the last meter-reading from the previous book is always entered in the column for that purpose; this reading is then subtracted from the reading for the next month to give the difference, which is entered in the column to the right of the regular reading column. This month's reading is used in a like manner in connection with the next month's work.

The "Delinquent" column at the left is for over-due accounts from the last book, and when the next month's accounts are made up this delinquent amount must be carried forward.

The five horizontal rulings for each name are for use in case bills are rendered weekly, as mentioned in connection with Form No. 54.

ER.



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The "Delinquent" column at the left is for over-due accounts from the last book, and when the next month's accounts are made up this delinquent amount must be carried forward.

The five horizontal rulings for each name are for use in case bills are rendered weekly, as mentioned in connection with Form No. 54.

CHAPTER III.

OBJECTS OF ACCOUNTING AND CLASSIFICATION.

BEFORE entering into a description of the general books it will be necessary to pay a little attention to the object of accounts and their proper analysis and classification.

The object of accounting may be briefly stated as follows, viz.: first, to determine and record the amount of the capital investment and the property in which it is invested. Capital is ordinarily advanced either in the shape of cash paid directly into the business, or property representing a stated value is turned over to the officers of the firm. In the first case it is necessary to credit the person or persons who pay in cash with the amount paid by them, and then to make a record of what it is paid out for: some cash capital will necessarily go to the operation of the business, while the remainder will be invested in the plant and commodity for which the business is organized. While record is made of each item for which the capital is expended, it is not necessary to keep an open account for each item, as such would be too cumbersome; it is therefore usual to start a few general accounts against which items of expenditure of a similar nature are charged. The nature and number of these separate accounts are always to be determined by the parties in interest, but in order to make comparisons between different houses it is necessary that some standard of classification be adopted. Where a business is conducted by a corporation or stock company the stock may be considered an artificial person who pays in the money or property for investment.

The second object of accounting is to show the amount expended in operating and carrying on the business, to whom it has been paid, and for what paid. This account of operating expense is divided usually into several heads, in order to show in some detail the object for which the money has been expended, or it may with perfect propriety be charged all under one head. The record of to whom the expenditure for operation is made is not necessarily entered on the general books, the items and

names appearing only on vouchers of those who furnish the material or labor; many houses prefer to keep the complete record on the general books, and the items and names are therefore entered in them.

Third, the accounts must show the amount of income received from the business operations; from whom it is derived, and for what it is received.

The old style of bookkeeping, in which all income was credited to "Merchandise," is now not enough in detail to satisfy most business men, as there are very few kinds of business in which the income is not derived from several sources, and it is quite advisable to show the income from each source separately; therefore separate accounts are opened for each, and income from each source is credited to its especial account.

The exact record of from whom the income is derived, while kept in detail in the books of first entry, such as journal, customers' ledger, and cash-book, seldom appears as accounts on the general ledger, but is all lumped under one head, either "Customers' Accounts" or "Sales" as may best suit the particular business.

Fourth, when the business has been in operation for a certain period, say a year, it is advisable to learn how it is resulting; therefore the total income is determined by adding together the amounts derived from the different sources, and the sum is credited to a new account called Profit and Loss. The amount paid out on the different accounts for operation is charged to the same account, all the other accounts being closed up at the same time, ready for a new and fresh start. An inventory must be taken of the property on hand to determine if there is more or less in value than that on hand at starting. The difference in value, if any, is really added to or subtracted from the profit or loss due to operation, as may be found, although the method of doing this is not exactly as here stated. The balance of Profit and Loss then shows the amount of gain or loss due to the operation of the business, and it is necessary to make some disposition of it. If a gain is found and it is thought proper, and there is sufficient cash to do so, it can be divided among the owners,—if a stock company, a dividend may be declared, or the balance may be carried to surplus account, thus increasing the value of the investment, or it may be left as undivided profits. If a loss, and not too heavy, it is usually left until the next year, when

the balance may be reversed and a profit shown, which can then be disposed of as above. If the loss is heavy, so as to badly impair the capital, action must be taken in the matter, and such disposal of the property be made as will best suit all interests.

Such in brief are the principal objects of accounting, and in order to facilitate this and to show the progress of the various parts of the business it is quite necessary that a proper analysis and classification be made. Such a classification should show for what the capital advanced has been spent, especially on the part of plant, machinery, and other equipment. On account of cost of operation, all the principal items for which expenditure is made should be placed under special heads: sometimes very few accounts are needed, and again it is best to provide a large number of them, according to how much detail of the business is cared for by the proprietors or officers. The accounts for the income of the business are nearly always less in number than those of operation, but should be enough to show the amount received from each of the principal departments. Much loss is often entailed through not knowing that one department is running behind. Besides the accounts called for by these three heads of investment, operating expense, and income, there are necessary many others that are simply means of keeping accurate record of the details of the business.

The first and simplest classification used in the past for Central Electrical Stations, and the one which is to quite a considerable extent still used, is to charge all payments for machinery, buildings, and plant, and any extension or betterment of the same, to one account, known generally as "Construction."

Expenditures for operation are in this classification charged to "Expense," which is sometimes divided into Carbon, Fuel, Oil and Waste, Labor, and Expense. Some larger stations have carried the classification farther yet and have included "Repairs" under a separate heading, sometimes dividing it into Steam, Electrical, and Line Repairs.

After the examination and comparison of a great number of systems of classification, the following is submitted as embodying the best features of all. While this classification differs but little from that of the Massachusetts Gas and Electric Light Commission, it must be said that it was developed independently before the writer had seen those schedules.

The classification will be treated under the following heads,

viz.: Operating Expense; Income from Operation; Profit and Lossaccounts; Property accounts, Resources; Liability accounts. These will be subdivided and developed, each account being explained and the matter that is properly chargeable to it designated; the whole being followed by charts showing the arrangement of the accounts under three different classes of schedules, so that one may be chosen fitting best to the station in hand; they will be known as schedules A, B, C.

CHAPTER IV.

OPERATING EXPENSE.

THIS department of accounts must include every charge for conducting the business and for keeping all apparatus and plant in running order. It is quite naturally divided into the three heads, viz., *Manufacturing*, *Distribution*, and *General Expense*.

MANUFACTURING.

This account is chargeable with all disbursements on account of operating and maintaining the plant and machinery inside the station and used for production of the current ready for distribution at the switchboards. It includes all repairs to and labor on any part of the apparatus in the station, from the prime mover, such as water-wheels, steam-engines, and boilers, through the shafting, belting, dynamos, and attachments, up to and including the switchboard and all their attachments,—in fact every expenditure made for getting the current ready in the station and delivering it to the lines ready for distribution.

A convenient subdivision of the account is as follows:

1. Repairs to motive power.
2. Repairs to electrical apparatus.
3. Labor (on manufacture).
4. Fuel.
5. Water (for boilers, or rent of water-wheels or use of water).
6. Oil and waste.
7. Sundries (for manufacture).

1. Repairs to Motive Power.—Chargeable with repairs to steam-boilers, flues, piping, engines, heaters, pumps, and all other steam appurtenances; repairs to water-wheels, gears, shafting, bearings, pulleys, and belting, up to the dynamo pulley.

Repairs of any kind to the motive power or any part of it between the boilers or flume and the dynamo pulley are to be charged in this account.

The first round of belting is chargeable to Construction and Plant accounts, and any renewals that are distinctly such must

be charged to "Sundries" (manufacture), while *repairs* on the same are charged here. The same may be said of packing for engines and pumps.

This whole account is often kept in much greater detail, and where the office force is sufficient it is advisable to divide it as follows: Repairs to Boilers; Repairs to Engines; Repairs to Water-wheels; Repairs to Shafting and Belting.

2. **Repairs to Electrical Apparatus.**—Chargeable with repairs to dynamos and all their appurtenances, as pulleys, armatures, connections, regulators (not rheostats), controllers, and switches; repairs to connections and conductors from dynamos to switchboards—switchboards and all attachments, such as connection-bars, switches, potential-indicators, current-indicators, rheostats, automatic and fuse cut-outs, lightning-arresters, and in fact all apparatus used on and about the board.

In full, this account must be charged with all repairs to any electrical apparatus inside the station buildings and used in the manufacture and preparation of current ready for distribution.

3. **Labor** (on manufacture).—Chargeable with wages of gateman, watchman, or other employé on water-power; firemen and coal-passers; engineers and oilers for steam-engines; engineers, oilers, and tenders for dynamos; switchboard-men; helpers and watchmen about the station; the portion of electrician's time that is devoted to work in the station; one-half the salary of the general superintendent.

In order that the books may at all times show the amount due to the employés as well as the total indebtedness of the company, it is necessary to use another account called "Wages Payable" (No. 67), to which the total amount of pay-rolls of all departments is credited when the pay-rolls are made out, the amount for each department being at the same time charged to the proper account. When payment is made on account of these pay-rolls, the amount is charged to "Wages Payable," and the balance at all times shows what remains unpaid. Form No. 59 is used for all labor accounts.

4. **Fuel.**—Chargeable with cost of all coal, wood, oil, or gas used as fuel for motive power, including with the original cost at dock or yard all charges for housing, unloading, carting, trimming, and any other charges that may be paid. Cost of fuel should be the actual cost in the bin.

5. **Water** (for boilers, for water-wheels, etc.).—Chargeable

with the cost of all water taxes for supplies for the motive power. For supply for boilers, if taken from the city mains, the amount charged belongs in this account; for water-wheels, the rent or tax for water rights, not properly belonging to real estate. Water for condensers is usually taken from some nearby natural supply, as so much is used that the cost would be prohibitive if taken from city mains. Artificial ponds with artificial methods of cooling are now coming into use for condensing water.

6. **Oil and Waste.**—Chargeable with all oils, grease, and other lubricants; waste, rags, wiping-towels, etc., used for cleaning the machinery. To the original cost of these must be added the express, freight, and cartage, barrels or other packing charges, or any other charges for delivery of the same.

7. **Sundries** (for manufacture).—Chargeable with any items that do not belong specifically to any of the above divisions of the Manufacturing Department. Some of them are: packing for piping, engines, and pumps, such as piston, piston-rod, and valve packing; brushes for dynamos; new belting to replace old,—in fact any supplies that are *renewals* and not *repairs*.

DISTRIBUTION.

This account is chargeable with all disbursements on account of distributing the electrical current from the station to the customer; for the maintenance of the lines, apparatus of all kinds outside the station, labor caring for them, and in fact any expenditure for the work or operation outside the station, from the switchboards, through the lines, to the installations in the streets or in buildings of any kind. The subdivision recommended for this is as follows:

8. Maintenance of pole-lines.
9. Maintenance of installations.
10. Maintenance of conduits and cables.
11. Maintenance of lamps, motors, and transformers.
12. Labor (on distribution).
13. Carbons.
14. Arc-globes.
15. Incandescent-lamp renewals.
16. Sundries (on distribution).

8. **Maintenance of Pole-lines.**—Chargeable with repairs to the overhead lines, renewals, and maintaining the same—such as poles, wire, taps from the lines to transformers, arc-lamps, and

to house circuits of any kind; including repairs to hoods and hanger-boards of arc-lamps; fuses, junction-boxes, primary switches, arc-circuit switches (outside), lightning-arresters (both inside and outside the station), and in fact all attachments and appurtenances of pole or overhead lines. This account ends at the main switch in the building of the customer.

9. Maintenance of Installations.—Chargeable with the cost of repairs to any and all installations, including the wiring, apparatus, and connections from the line or main switch to the lamps, or any other device for using the current; repairs to wiring, to fixtures, or to any other attachments in the building or connected with the circuit inside the building; rehanging arc-lamps; changing the location of incandescent lamps; replacing cut-outs, fuses, moulding, or any other matter pertaining to the inside installations, or arc-lamps for city use, or in fact repairs to and maintaining of any and all installations for using electric current, when not chargeable directly to the customer.

There seems to be no good reason for the free installation of incandescent lamps, any more than that a gas company should pipe a house or building free of charge. Such free wiring was necessary to a great extent during the early days of the business, owing to lack of confidence on the part of the customer; but it is in no case necessary now, and it is fast passing out of the hands of the central station company, and into those of contracting companies formed for the purpose of wiring and construction, and will soon be on the same footing as plumbing, steam and gas fitting.

10. Maintenance of Conduits and Cables.—Chargeable with repairs to and maintenance of a system of underground conduits or pipes for holding cables, including all main, distributing, and subsidiary ducts; repairs to cables themselves when not laid in underground conduits; repairs to cables and all underground conductors, including all main cables, distributing-cables, and taps, cables to buildings up to and including the primary switch or cut-out placed directly at the entrance to the consumer's premises.

11. Maintenance of Arc-lamps, Motors, and Transformers.—Chargeable with repairs to and cleaning of arc-lamps; repairs to transformers of any kind; repairs to motors owned by the electric company when not properly chargeable to the user. Arc-lamps must be kept in good repair and adjustment, or the

results will be very unsatisfactory. Some superintendents now have each trimmer bring in one lamp each day or one every other day, according to the nature of the locality and work; this lamp is cleaned, adjusted, and placed in stock, or taken out again. This method insures the cleaning of each lamp at least twice a year. Probably the most careless thing done by trimmers is to not sufficiently clean the carbon-rod, in which case it will be found covered with spots made by the poor contact with bushings or brushes or whatever connects it with the current. Immediate discharge should follow such negligence.

Motors sometimes need the commutator turned down, or new brushes; transformers sometimes develop a contact between two or more different layers, or between coils, or between core and winding. Any and all repairs of the above apparatus are chargeable here.

12. Labor (on distribution).—Chargeable with one-half the salary of general superintendent; wages of trimmers, inspectors, linemen (not on construction), ground-men, and other helpers on line, meter-men and readers, insulators and plumbers on underground cables; and any part of the electrician's time that may be devoted to this department. In many cases it will be better to charge half the electrician's time here and the other half to "Manufacturing—Labor" rather than to attempt to make any more exact division. Charge here any and all wages and salaries paid for maintaining and operating the distribution of the electric current.

13. Carbons.—Chargeable with cost of carbons for use in arc-lamps: this cost must include all freight, express, and cartage; in fact all delivery charges must be added to the first cost, so that the net cost delivered in the storeroom may be known and used in all calculations.

14. Arc-globes.—Chargeable with the cost of all globes used on arc-lamps; like the carbons, all delivery charges, charges for packing, etc., must be added to the original cost.

15. Incandescent-lamp Renewals.—Chargeable with the cost of all incandescent lamps used for replacing those burned out or destroyed in service. Should lamps be sold to customers the amount of such sales should be credited here in order to show whether there be a profit or loss. All charges for packing and delivery to the storeroom should be added to the original cost of the lamps.

Care must be taken that no lamps intended for new installations be charged in this account: they are charged in such case either to "Construction" or to the customer, according to whether the installation is free or charged.

16. **Sundries** (on distribution).—Chargeable with stable-rent or horse-hire; tools used in distribution and not charged to "Expense"; rents for privileges on poles, on pole-lines, in underground conduits, and for use of cables.

Any charges for items belonging in this department, but not coming under some one of the subdivisions of it, are chargeable here.

GENERAL EXPENSE.

This account is chargeable with all disbursements on account of operation not chargeable to either of the other two departments. It is intended to include all the office accounts and expenses, insurance, taxes, rent, legal expenses, as well as many outside expenses difficult to classify.

It is intended to cover the disbursements on account of the executive end of the business.

The subdivisions are as follows:

17. Maintenance of real estate and buildings.
18. Labor (general expense).
19. Rents, due and accrued.
20. Insurance, due and accrued.
21. Taxes, due and accrued.
22. Salaries, office and official.
23. Legal expenses.
24. Interest, ordinary.
25. Sundries (general expense).

17. **Maintenance of Real Estate and Buildings.**—Chargeable with the cost of all repairs to buildings and smoke-stacks, grounds, dams for water-power, penstocks, raceways, flumes, gates, tail-races, or anything belonging to the real estate and buildings.

Buildings require repairs to roofs and other parts; land is sometimes washed out by rains and has to be replaced; dams are occasionally washed away or broken; penstocks and flumes sometimes burst or leak; gates to penstocks and wheels are broken. Any of these is liable to happen, and disbursements made on their account must be charged here.

18. **Labor** (general expense).—Chargeable with wages of storekeeper and helpers, watchmen, and the cost of all other labor not coming prominently under any of the previously mentioned divisions. This head does not include salaries of any of the office force; a separate account is provided for them.

19. **Rents, Due and Accrued**.—Chargeable with monthly amounts due for rentals of any kind (excepting telephone and water) by the company, such as the rent of land, buildings, power, poles, lines, conduits, cables, and in fact any and all rents payable.

This account is seldom kept by any but the most careful corporations, but is of very great assistance in determining the indebtedness of the company in making monthly reports. The usual method is to charge the entire amount paid for rent to a rent account at the time of payment, crediting it to "Cash" or to the lessor when so paid or due.

The above account is handled as follows: As the amount of rent that will become due at a certain time is a matter of contract or agreement, it is a perfectly easy matter to divide such amount into monthly parts and to charge a part to this account, "Rents, Due and Accrued," each month, at the same time crediting the same amount to "Rents Payable" (No. 68). The account then shows the necessary expenditure for rent, whether it has been paid or not, and becomes a part of the monthly report.

If reports are not made monthly or at any time excepting yearly the account is scarcely necessary, but a separate item will have to be made of rents due for the annual report.

20. **Insurance, Due and Accrued**.—Chargeable with monthly amounts due for insurance of any and all kinds on buildings, plant and machinery, pole-lines, cables, installations, employés, etc.

The account is handled in a similar manner to that above. The amount of insurance premiums is divided into monthly instalments or parts, and a part is charged to this account and credited to "Insurance Advanced" (No. 60) each month, and shows how much is expended on insurance.

21. **Taxes, Due and Accrued**.—Chargeable with monthly amounts due for taxes of all kinds on real estate, franchise, machinery and plant, pole-lines, conduits, cables, and in fact taxes of all kinds on any and all property. Water tax, so called,

is not chargeable here, as it is rather an item of rent or payment for supplies and comes under the head of "Manufacturing"

The account is handled in a similar manner to Nos. 19 and 20, that is, the total annual taxes are divided into monthly parts and a part charged to this account each month and at the same time credited to "Taxes Payable" (No. 69). The balance of this account shows at the end of the month the actual necessary expenditure for taxes, whether paid or not.

22. Salaries, Office and Official.—Chargeable with all office salaries, including general officers, directors, managers, cashiers, accountants, clerks, canvassers, collectors, and in fact any salaries paid for the office end of the business. The Pay-roll given in Form No. 59 is made up for *labor* only and must not be used for office salaries, a new one being necessary for that purpose: it can be made on a regular voucher, or separate vouchers for each office employé can be made out on Form No. 64, as may be desired by the officials.

23. Legal Expense.—Chargeable with all attorneys' fees connected with any litigation by the company, including the retainer and salary of any permanent attorney, fees paid to attorneys for collecting accounts, and in fact any expenses of a legal nature.

24. Interest, Ordinary.—Chargeable with interest paid for the use of money for the current or ordinary business of the company, and may be credited with any interest that is collected for loans or deposits. Payments on this account must be kept carefully separate from any payments for interest on bonds, mortgages, or any other form of security issued by the company.

25. Sundries (general expense).—Chargeable with all office expenses, such as books, stationery, fuel and lights, telegrams, telephone rental, travelling expenses, and any and all expense incurred in running the office. This account is also chargeable with any unusual expenditure that cannot be classified elsewhere under "Operating Expense."

The above twenty-five subdivisions cover every item of operating expense and are thought to be sufficient in detail to show the workings of the plant.

We now come to a department of the business which is the converse of "Operating Expense," viz., Income from Operation, which will be fully treated in Chapter V.

CHAPTER V.

INCOME FROM OPERATION.

THIS account must include every item of income derived from the operation of the plant itself, but must be kept clear of income from any other source; such other items will be treated of in a separate account called "Miscellaneous Income."

It is desirable to know the amount of income derived from each department of the business, and the following subdivisions are considered to cover all items necessary for a complete knowledge of the same.

26. Arc-lighting, street.
27. Arc-lighting, commercial.
28. Incandescent lighting, street.
29. Incandescent lighting, commercial.
30. Incandescent lighting, residence.
31. Power, stationary motors.
32. Power for street railways.
33. Rent of motors.
34. Rent of meters.

As all accounts of income from operation are handled in a similar manner, one explanation will do for all, and it will be only necessary to mention the items classified under each head.

The use of the income accounts is as follows: when the customers' accounts are made up on the customers' ledgers at the end of the month, the amount of income due from each department or division of service is credited to the proper department account in the abstract book of "Income from Operation," at the same time being charged to another account called "Customers" (No. 53), which is explained further on. The footing of each of these income accounts then shows at any time the total gross earnings from the operation of those departments for the period covered.

In using customers' ledgers forms Nos. 52 and 53 it is necessary to draw off onto a separate list the amount of each customer's

account in order to get the total income and trial balance; and as it is a tedious job it is seldom done, and the itemized income is not accurately known.

In using forms Nos. 54, 55, and 56, the footing of the column "Amount Due" shows at once the income from operation; and where the accounts are properly separated under the divisions as named above, the footing of each division can be posted at once to the credit of its account on the ledger, and charged to "Customers."

Separate books should usually be used for meter and contract customers, unless a ruling is made so that both accounts can be separated on each page. It will be noticed also, as previously mentioned, that the footing of the customers' amounts due also furnishes the trial balance.

26. Arc-lighting, Street.—To be credited with income from the rental of arc-lamps or current furnished to the city or municipal corporation, including lights used in public streets, alleys, and public parks. The amount of space to be devoted to this account in the customers' ledger will depend somewhat on how the corporation authorities wish the bills made out: in some cities the lighting of each street has to be billed separately, while in others a lump bill for all lights burned during the month is all that is required.

27. Arc-lighting, Commercial.—To be credited with income from rental of arc-lamps to business houses, factories, etc. There are so very few arc-lamps used for lighting residences that it is not worth while opening an account for them, but they will be entered in this account. It is always a question whether incandescent lighting on arc circuits should be credited to this account or to incandescent-lighting accounts: the latter is much preferred by the writer.

28. Incandescent Lighting, Street.—To be credited with income from rental of incandescent lamps or current furnished for lighting the public streets, alleys, and parks of a city or municipal corporation.

29. Incandescent Lighting, Commercial.—To be credited with income from rental of incandescent lamps or current furnished to business houses, factories, shops, etc., but not to include private-residence lighting.

30. Incandescent Lighting, Residence.—To be credited with income from incandescent lamps rented to, or current



furnished for lighting, private residences. In many stations this item is so small at the present time that it is scarcely worth while keeping the account separate, unless it is desired to watch its growth.

31. Power, Stationary Motors.—To be credited with income from current furnished for running stationary electric motors for power purposes, in shops, stores, factories, etc. It does not include the rental of the motors themselves, as they are most generally owned by the parties using them; should there be such rentals they are cared for in another account (No. 33).

32. Power for Street Railways.—To be credited with income from current furnished for street-railway motors. This is sometimes furnished by the kilowatt-hour, sometimes by the electrical horse-power hour, both being measured at the switch-board, or by the car per day or car-mile run, as may be agreed on by the parties interested.

33. Rent of Motors.—To be credited with income received from the rental of motors for stationary-power purposes in shops, stores, factories, etc. When the electric-power service was first started it was so difficult to sell a motor that the method of renting them was developed; the earlier companies in the business also thought to hold the electric power to themselves by not disposing of the motors; but it did not work well, and nearly all modern stations furnish current only and allow the customer to buy his motor where he chooses.

34. Rent of Meters.—To be credited with income received from the rent of meters for measuring the amount of current furnished. With gas companies this is a common thing, as often the amount received from the lighting will scarcely pay the interest on the cost of the meter. It has seldom been done in electric lighting.

The principal accounts of operation are now finished, but there remain three other accounts which have a direct bearing on the operating accounts, and they are described below.

35. Rebate Account.—Chargeable with all rebate or allowance on customers' bills. The total should be credited at the end of the month to "Customers" (No. 53), and it must be kept entirely clear of any credit discounts on bills paid for supplies: when a bill for supplies is discounted the amount of such discount should be deducted from the face of the invoice be-

fore auditing, or be credited to a "Discount Account" opened for the purpose, this new account being closed into "Profit and Loss" at the closing of the books; or the amount of discount may be credited directly to "Profit and Loss" when made. When the books are closed the total of this "Rebate" account is charged into "Income from Operation" and the account closed.

36. Miscellaneous Income.—To be credited with any income from sources outside of operation. It is a small account, as Central Electrical Stations seldom have income from anything but operation. Income from the sale of *old* material must be credited directly to the account from which it is taken, thus reducing the total cost of that department. Income received from sale of *new* material comes under the head of "Shop Account" (No. 37).

37. Shop Account.—Chargeable with the storeroom cost of all material sold for installations or other work, and the cost of labor connected with the installation of the same; to be credited with the amounts received or charged for installations or sales of material. This account is especially designed to show whether there is a profit or a loss in making installations of lamps and other apparatus. It is a general thing to charge a stated amount per lamp for the different styles of installation, such as for cleat work, moulding work, concealed work. The storekeeper must make out a bill of material furnished, deducting any that may be returned when the job is completed; to the prices paid for the material must be added all charges for delivery, so that the cost in the storeroom will be the total cost. Against this is credited the amount of the bill to be charged to the customer, or in case it is goods or material sold, only, the amount paid for such. The balance of the account at the closing of the books shows whether there has been a profit or a loss from the transaction, and is closed into "Profit and Loss."

CHAPTER VI.

PROFIT AND LOSS.

HAVING now worked out the scheme of accounts for expenses and income of the operating department, we come to the point of determining whether the business has been conducted at a gain or loss, and how to dispose of either the one or the other. For this purpose an account is opened called—

38. Profit and Loss.—According to the writer's notion, this account should show only the profit or loss from operation, and should therefore only be credited with the income from operation, and from "Shop Account" if that account shows a profit, and should be charged with the expenses of operation, the loss on "Shop Account" if such is shown, and the balance of "Suspense Account" (No. 54), which is made up of doubtful customers' accounts charged off as no good. The balance of "Profit and Loss" account then shows the actual gain or loss from operating the business, and this balance is closed into "Surplus Account" (No. 72), which disposes of the entire schedule of operating accounts.

Having now determined the net income from operation, there are a few items to be deducted from that amount and one to be added, the latter being "Miscellaneous Income" (No. 36), previously described, the balance being credited to "Surplus." The accounts to be deducted from "Surplus" are "Interest, Due and Accrued, Coupon Account," "Dividends Declared," and "Depreciation on Machinery and Franchise."

39. Interest, Due and Accrued, Coupon Account.—Chargeable with the monthly amount of interest due on bonds or other security issued by the company. This account is handled in the same manner as Rents, Insurance, and Taxes, Nos. 19, 20, 21 of the "General Expense" accounts; that is, the total annual interest on bonds is divided into monthly parts and a part charged to this account each month and at the same time credited to "Interest Payable, Coupon Account" (No. 70).

showing at any time the amount due and accrued for the period. The balance is closed into "Surplus" (No. 72).

40. Dividends Declared.—Chargeable with the amount of any dividends declared by the company officials; the same amount must at the same time be credited to "Dividends Payable" (No. 71). As previously stated, the balance of this account is closed into "Surplus" (No. 72).

41. Depreciation on Machinery and Franchise.—Chargeable with any amount of deduction from the value of plant, machinery, real estate, and franchise.

This is an account heretofore given very little attention by central station companies. In an intimate acquaintance with some two hundred companies very few are recalled that have kept an account of this nature. In an old and well-established business it is considered quite proper to charge off at the end of the year an amount for depreciation in value of machinery and plant.

This amount is variously estimated: generally a certain percentage on the value of the plant at the time is taken, or a lump sum, anything that may be deemed right by the officials, is charged off. Another way is to charge off each year an amount such that at the end of a period, say ten years, the entire value of the plant will be wiped out.

Any business that will not stand such a deduction is not and can never be considered on a paying basis, for it is running on altogether too close a margin. The fact that the plant may be kept in perfect repair has no bearing whatever—the repairs must be charged to "Expense."

It is especially desirable that a depreciation be charged on electrical machinery, as it becomes obsolete so quickly and of no selling value whatever.

In computing the operating expenses of central stations for the Census Office, a schedule of rates for depreciation was adopted which seems fair in every way; it is as follows, viz.: on buildings, dams, races, penstocks, and flume, $2\frac{1}{2}\%$; on motive-power plant, and electrical plant in station, 5%; on pole-lines and all lamps and apparatus installed outside for use, 10%; on conduits and cables underground, 5%.

Occasionally a company pays a certain amount to the city or town for a franchise or privilege of using the streets for pole-lines or conduits. This franchise is paid for in various ways, the two most common being, first, the downright payment of a

sum of money for a term of years ; second, the yearly payment of a certain amount as a tax.

When paid for by the first method it is evident that the value decreases with each year, and it is proper that each year's value should be calculated and charged off at its expiration. In some few cases the value of the non-expired portion increases faster than the decrease, but this can only be determined by a sale of the property. This paragraph applies equally well to the purchase of patent rights and of licenses of various kinds.

When paid for by tax the payment comes under the head of "Taxes Payable," and no charge is made for depreciation unless for a stated term of more than a year.

The computed depreciation on plant and franchise should be charged to this account, and each amount credited to its own proper department in the "Construction" accounts. When the books are closed, "Depreciation Account" is closed into "Surplus" as being a deduction from "Surplus Earnings."

CHAPTER VII.

PROPERTY ACCOUNTS.

IN this chapter will be described the property accounts or resources, taking up the construction and various representative accounts.

Construction accounts are classified as follows :

- 42. Land.
- 43. Station and buildings.
- 44. Motive power.
- 45. Arc apparatus.
- 46. Incandescent apparatus.
- 47. Power apparatus.
- 48. Pole-lines.
- 49. Installations.
- 50. Conduits
- 51. Cables.

42. Land.—Chargeable with the cost of all land owned by the company ; water ways or privileges ; dams ; penstocks ; canals and tail-races. The cost of betterments made to any items of property coming under this head must be added when made, unless charged to a separate account until the books are closed.

43. Station and Buildings.—Chargeable with the cost of buildings of any nature belonging to the company, including smoke-stacks or chimneys, also flume for water-power. The cost of betterments to buildings or flume during the year may be charged up at the end of the year, or when completed, as desired.

44. Motive Power.—Chargeable with the full cost of all prime moving apparatus, such as steam-boilers, engines, piping, pumps, and all their appurtenances ; water-wheels ; gearing, shafting, pulleys and their attachments, and all of the first lot of belting up to the dynamo pulley ; all permanent tools per-

taining to the motive-power plant. Betterments must be charged up as in the two preceding accounts.

45. **Arc Apparatus.**—Chargeable with the full cost of all arc-lighting dynamos, connections, regulators, controllers, instruments, and switchboards pertaining to the arc-lighting system. Betterments to be added yearly.

46. **Incandescent Apparatus.**—Chargeable with the full cost of all incandescent-lighting dynamos, connections, regulating apparatus, exciters, transformers, switchboards and appliances, meters for incandescent lighting (although it is well to open a special account for them); all apparatus pertaining to incandescent lighting. Cost of betterments to be added as made or at end of year.

47. **Power Apparatus.**—Chargeable with the full cost of all generators, dynamos, and exciters used to generate an electric current for power purposes, including all connections, regulators, rheostats, switchboards—for power purposes only—all, in fact, going to make up the cost of apparatus run by the company to furnish electric-power service. Cost of betterments may be added from time to time or at the end of the year as desired.

48. **Pole-lines.**—Chargeable with the full cost of poles, set; all lines of overhead wires, cross-arms, pins, and braces; all apparatus outside the station used on pole-lines, such as arc cut-out switches, junction and feeder boxes, lightning-arresters; any connections to, but not including, arc-lamps and transformers. When incandescent lamps are used for street lighting, the lines and fixtures to the lamps will be included here together with the first round of lamps.

49. **Installations.**—Chargeable with all disbursements for cost of the installations of arc-lamps, incandescent lamps, and motors, or in fact any apparatus used by the customer but belonging to the company. But for the fact that companies are avoiding as far as possible the free installation of incandescent lamps, it would be much better to divide this account into three, viz., "Arc Installations," "Incandescent Installations," and "Motor [or Power] Installations." The last two are going out of use fast; therefore the "Arc Installations" would soon be the only item.

Installations for arc work include only the lamp and its attachments, as the writer is much in favor of charging the cost of hanging it to "Expense," when the customer cannot be made

to pay for it. Arc-lamps for commercial use are generally more or less temporary, the labor cost in putting up is mere expense, and the material used is seldom of any account after removal; therefore it seems the better plan to charge it all to "Expense" at first. In incandescent work the installation includes all material on the customer's premises belonging to the company.

50. Conduits.—Chargeable with all expenditure for construction of underground conduits or subways for electrical conductors, including the cost of all subsidiary or service connections to houses or other buildings or to street lamp-posts. Labor, unpaving, repaving, material, etc., in fact every part of the complete system must be included up to, but not including, any wires, cables, or conductors. The cost of franchise or right to construct the above is discussed under the head of "Franchise and Patents" (No. 52).

51. Cables.—Chargeable with the cost of all underground conductors of any kind, including the cost of all subsidiary or service connections to buildings or street lamps.

This word *cables*, while properly meaning only multiple or armored conductors, has now come to mean any wire, single or multiple, that is used underground, and is more especially applied to those conductors that are mechanically protected in some manner.

The second division of property accounts, here called representative accounts, as they represent under suitable headings the different classes of resources, are classified as follows:

- 52. Franchise and patents.
- 53. Customers.
- 54. Suspense.
- 55. Store.
- 56. Open accounts, receivable.
- 57. Bills receivable.
- 58. Investments.
- 59. Sinking-fund.
- 60. Insurance advanced.
- 61. Cash.

52. Franchise and Patents.—Chargeable with all expenditure for the purchase of any and all franchises or privileges for a term of years, and of patent rights whether perpetual or for stated terms. This account is not to include either of the above

privileges when paid for annually as a tax, or by royalty as is a common method with patents.

Franchises for the use of streets are nearly always voted to the central station companies free of cost, as people are glad to have the electric current ready for use.

Franchises for conduits are as yet few, and the method of payment not determined, as payment of any kind for them is seldom required. The question is further discussed in "Depreciation" (No. 41).

At the end of a year or at the closing of the books a certain amount, either percentage of the whole value or a stated amount, is credited to "Franchise" and charged to "Depreciation," as stated in that account (No. 41). The balance shows the book value of the "Franchise and Patents" and is used on the "Balance-sheet." The value of franchises is difficult to estimate and sometimes increases much above any possible depreciation.

35. Customers.—Chargeable with the total monthly earnings from the individual customers' accounts, and to be credited with total monthly cash or other payments, and rebates or other allowances. The balance shows what is due from customers.

This account is not always necessary, as the amount of the customers' balances is the same and can be written up as such; the items of cash and rebate are best posted to this account in lump from the cash-book at the end of the month, after the separate items have been posted to the customers' individual accounts on the customers' ledgers. The balance due as shown by this account must agree with the total of the delinquent accounts on customers' ledgers.

54. Suspense.—Chargeable with the balance of any customers' accounts long overdue and of doubtful value.

It is sometimes kept open at the end of the year and the balance used as an asset, but is more properly closed into "Profit and Loss" annually.

55. Store.—This account may be treated in one of two ways: either make it a regular supply department with a good bookkeeper at its head and charge all supplies of any nature to it, the storekeeper billing back to each department at the end of the month the value of supplies used by it; or treat it merely as a storeroom where supplies are given out, the storekeeper rendering an account only for comparison and reference,

FORM No. 57.

STOREKEEPER'S REPORT.

.....189 .
SUNDRIES. Dr. to STORE ACCOUNT.
For the.....ending.....189 .
.....Store Clerk.

Manufacturing :

Repairs to motive power.
Repairs to electrical apparatus in station
Fuel.....
Water.....
Oil and waste... ..
Sundries for manufacturing.....
.....
.....

Distribution :

Maintenance of pole-lines.....
Maintenance of installations.....
Maintenance of conduits and cables.....
Maintenance of arc-lamps and motors.
Carbons.....
Arc-globes.....
Incandescent renewals.....
Sundries for distribution.....
.....
.....

General expense :

Sundries.....
.....
.....
.....

Construction :

Land.....
Station and buildings.. ..
Motive power.....
Arc apparatus.....
Incandescent apparatus.....
Power apparatus.....
Pole-lines.....
Installations.....
Conduits.....
Cables.....
.....
.....
.....

Sundry special accounts.. ..

.....
.....
.....

Total.....

[Indorsement.]

Register Folio.....	Voucher No.....	..
In favor of STORE ACCOUNT.		
Chargeable to		
Manufacturing.		
Distribution.....		
General expense.....		
Construction.....		
Total credit to Store Account..		

NOTE.—Convenient size, 9" x 20" to fold to size of vouchers.

FORM No. 58A.

..... 189 .

BLANK ELECTRIC LIGHT AND POWER COMPANY,

To..... Dr.,
for the following items, the original invoices for which are attached.

RECEIPT ALL.

Approved for \$.....	Received of the Blank Electric Light and Power Company	.....189 .	
General Manager.	..... Dollars,		
Approved,	in full payment of the above account.	.....

NOTE.—Convenient size, 7½" x 9".

[Indorsement.

Register Folio..... Voucher No.
C.-B. Folio ... Date paid..... 189 .
In favor of

.....		
Chargeable to		
<hr/>		
MANUFACTURING.		
.....		
.....		
.....		
DISTRIBUTION.		
.....		
.....		
.....		
GENERAL EXPENSE.		
.....		
.....		
.....		
CONSTRUCTION.		
.....		
.....		
.....		
SUNDRY ACCOUNTS.		
.....		
.....		
.....		
.....		
<hr/>		
Total of this voucher.....		
<hr/>		

the distributing of items on the original invoices being made in the accounting department, written on the back of the voucher cover (Nos. 58 and 58A), and entered directly in the books from that distribution.

The first method is far more accurate where monthly accounts are required, and uses less books, as only "Store," "Open Accounts, Payable," and "Audited Voucher" columns are used for invoices, and but one item of distribution is given at the end of the month, that being taken from the "Storekeeper's Report" (No. 57) as rendered.

The abstract of operating expenses is kept by the bookkeeper at the head of the store department, and he makes out a regular bill at the end of the month, giving the footings of the columns in his abstract book as the amount expended for Operation and Construction, the total being credited to "Store Account."

Invoices are entered on voucher covers, either one of Nos. 58 and 58A, the whole amount being charged directly to "Store."

The balance of this account at the end of the month shows the amount in value of the supplies on hand. It is not to be expected that an inventory of the supplies and material on hand will agree exactly with the balance of "Store Account"; it will almost always be found that the balance of the account as shown on the books will be more than the amount of inventory, owing mostly to not charging enough and failure to account for many small items, also to loss by breakage and loss of many small pieces. Any discrepancy of this sort can be charged off *pro rata* to the different operating-expense accounts.

The second method, the one most largely used, is for the storekeeper merely to take in and deal out supplies necessary to the business; the distribution of items among the different accounts being made from the invoices themselves, after receipt of the goods is acknowledged by the storekeeper and approved by the proper official. The storekeeper makes a report of the *amount* of different materials used during the month, and from this a report of operating expense of more or less accuracy is made.

This method requires somewhat more bookkeeping, is not so accurate for monthly reports, and does not show the amount of material and supplies in stock.

It is not at all necessary to employ a special man for store-keeper in small stations, as the bookkeeper or clerk can perform that office, or the dynamo-man can be empowered to give out supplies, or even the man in charge can take that work on his hands. It is positively necessary that supplies should not be left open and free for any one to take such as he pleases.

56. Open Accounts Receivable.—These are running accounts with certain debtors who may be doing business with the company constantly and do not settle very often. Outsiders may buy supplies or any other commodity not connected with the operating department. Customers for lighting or power are in no case to be entered under this head.

57. Bills Receivable.—Chargeable with the face value of any notes or paper given the company in payment of accounts in lieu of cash.

To be credited with the amount of cash received at its maturity and with any discount that may be made if paid before that time.

This account is the common name for notes or other obligations for payment received by the company in place of cash, and does not differ in any way from the same account under the same name in any other business.

58. Investments.—Chargeable with the value of any stocks, bonds, or other securities or property owned by the company as an investment of surplus funds. As yet there are not many central station companies in position to use this account.

59. Sinking-fund.—Chargeable with the amount set aside by the officials to provide for the payment of bonds or other obligations maturing at some future date. It is usually paid to a board of trustees appointed for the purpose by the directors. The money so placed is treated as an asset and is, like any other investment, usually at interest.

60. Insurance Advanced.—Chargeable with the amount of insurance premium paid in advance for any kind of insurance on the company's property or employes.

As insurance premiums are nearly always payable in advance and seldom fully expired at the end of the year or closing of the books, the balance is a valid asset and is placed among the resources on the balance-sheet.

In No. 20, "Insurance, Due and Accrued," is shown how to dispose of the amount of premium in monthly instalments;

the amount due for each month being credited to this account and charged to "Insurance, Due and Accrued." The balance of this account shows the amount of unexpired insurance.

61. **Cash.**—Chargeable with the amount of all cash receipts, and to be credited with the amount of all cash payments; the totals for this purpose being taken from the footings of the cash-book at the end of the month. The balance shows the amount of cash on hand at the time.

CHAPTER VIII.

LIABILITY ACCOUNTS.

THIS chapter treats of the liability accounts, which are classified and described under the following heads, viz.:

- 62. Capital stock, issued.
- 63. Bonds, mortgage account.
- 64. Audited vouchers payable.
- 65. Open accounts payable.
- 66. Bills payable.
- 67. Wages payable.
- 68. Rents payable.
- 69. Taxes payable.
- 70. Interest, coupon account, payable.
- 71. Dividends payable.
- 72. Surplus.

62. **Capital Stock, Issued.**—To be credited with the par value of all company shares, if a stock company so-called ; or with the total amount of cash or value of other material contributed as capital investment, if a private company or partnership.

The capital stock of electrical station companies is issued for cash, for franchise or rights of way, for patent rights, for valuable property turned over, and quite often for promotion of the company.

When issued for cash, cash account is debited with the amount received, the same amount being credited to this account. If the sale is at less than par value the balance is credited here also and charged to Promotion or some other similar account. If sold above par the premium above the par value is to be credited to "Surplus" (No. 72), or to a "Premium on Stock Account" opened for the purpose and which is closed into "Surplus" at the end of the year.

Shares issued for franchise, rights of way, patents, etc., must be charged to those accounts.'

There are various methods of disposing of shares issued for promotion, but the better way is to charge them to an account of that name, or they can be charged to Franchise or Rights of Way.

63. Bonds, Mortgage Account.—To be credited with the par value of all bonds issued by the company, firm, or person.

Bonds or similar obligations are issued for enlargement of plant, payment of debt, or to secure funds for any purpose whatever. They are protected by mortgage on the plant or other property.

If bonds are sold for cash at par the amount is charged in "Cash" and credited in this account. If sold for less than par the difference may be charged to an account opened for the purpose, or may be charged directly to the debit of "Surplus." If sold at a premium the premium may be credited to an account opened for it, or to "Surplus."

If issued for property the total value of the property must be charged to the Construction accounts to which it belongs, being distributed under the different heads.

When issued for franchises, rights of way, patents, or promotion, the value is to be charged to the account for which issued.

64. Audited Vouchers Payable.—To be credited with the amounts of such invoices as have been approved and audited.

Invoices of supplies or materials when received are referred to the proper clerks for checking, for proper order, for quantity, for prices, for extensions, and, if not charged in lump to "Store," for proper distribution of accounts. They are then attached to a voucher cover, Form No. 58 or 58A, the chief items being entered on the inside face of the cover, and the distribution made on the outside. The voucher is then approved by the proper officials and is ready for entry on the books.

If the "Store" method of accounting is used the total is charged to "Store" and credited to this account, "Audited Vouchers," unless the makers of the invoice have an open account with the company, in which case the amount is credited to their account.

If the "Store" method is not used the total amount of the voucher is credited here as before, and the items as distributed are charged to the different departments, and the voucher is then used for entering the amounts coming under each subhead in the divisions of each department on the "Abstract Book."

The total of "Audited Vouchers" together with the total of "Open Accounts" really makes up the floating debt of the concern.*

65. Open Accounts Payable are the open creditors' accounts, which are to be credited with the amount of any audited vouchers the makers of which are doing a continuous business with the company and do not care to settle for each invoice. The name is perhaps misleading, as instead of being one account of this name there are numerous accounts, the footing of all of which might be under this head.

66. Bills Payable.—To be credited with the face value of any notes, acceptances, or other obligation, excepting bonds, issued for funds. It is charged with the amount of cash paid at maturity or when discounted. If discounted, the amount of discount must be charged here and credited to a discount account or directly to "Surplus" as may be considered best.

The account in no way differs from the same carried in any other business.

67. Wages Payable.—To be credited with the amount of pay-rolls as charged by item to the different departments. It is chargeable with the amounts paid either in cash or by other means. The balance shows what remains unpaid for labor.

For instance, a pay-roll may be made up for the month, taking in the last day: it may not be payable until, say, the 10th of the succeeding month. The amount of the pay-roll is entered when it is made up in the accounts "Wages Payable" and "Labor" for the different departments. The former shows a balance, when the monthly report is completed, of wages unpaid, and is a liability.

68. Rents Payable.—To be credited with the total amount of rentals due and accrued by the company for the rental of any part of the plant or business. It is chargeable with the amount of cash or other payment, the balance showing the amount payable, but perhaps not due, for rents.

69. Taxes Payable.—To be credited with the total amount of taxes due and accrued by the company for any purpose. It is chargeable with payments made for the same, the balance showing the amount payable, but perhaps not due at the

* See forms Nos. 58 and 58A, pp. 35-38.

[Indorsement.]

Register Folio..... Voucher No.
C.-B. Folio. .. Date paid..... 189 .
In favor of

CASH.

Chargeable to

Manufacture.		
Distribution.....		
General expense.....		
Construction.		
.....		
.....		
.....		
.....		
Total credit to Cash.....		

Approved for \$.....

For PAY-ROLL,

.....
General Manager.

I hereby certify that the within-named persons have worked the number of days set against their several names, and that the rates given are correct.

.....
Superintendent.

time. If taxes are payable in advance this account will be a resource and will be known as "Taxes Advanced," and will be similar to "Insurance Advanced."

70. Interest, Coupon Account.—To be credited with the amounts of interest due and accrued on bonds issued by the company. It is chargeable with payments made on the same, and the balance shows the amount of interest payable, but perhaps not due at the time.

71. Dividends Payable.—To be credited with the amount of dividends declared by the officials at any time, and chargeable with the amount of payments made on the same. The balance shows the amount of dividends remaining unpaid.

72. Surplus.—To be credited with the balance of Profit and Loss account, income from miscellaneous sources, and any other items of gain not disposable in other accounts. It is chargeable with "Interest, Due and Accrued, Coupon Account," "Dividends Declared," and "Depreciation on Machinery, Plant, and Franchise," together with such other items of loss as are not disposed of in other accounts. The balance shows the net surplus or gain to be carried forward on the new year's account.

CHAPTER IX.

GENERAL CLASSIFICATION.

OPERATING
EXPENSE :*Manufacturing :*

1. Repairs to Motive Power.
2. Repairs to Electrical Apparatus.
3. Labor (on manufacturing).
4. Fuel.
5. Water for boilers, water tax or rent.
6. Oil and Waste.
7. Sundries (manufacturing).

Distribution :

8. Maintenance of Pole-lines.
9. Maintenance of Installations.
10. Maintenance of Conduits and Cables.
11. Maintenance of Arc-lamps, Motors, and Transformers.
12. Labor (on distribution).
13. Carbons.
14. Arc-globes.
15. Incandescent-lamp Renewals.
16. Sundries (on distribution).

General Expense :

17. Maintenance of Real Estate and Buildings.
18. Labor (general expense.)
19. Rents, Due and Accrued.
20. Insurance, Due and Accrued.
21. Taxes, Due and Accrued.
22. Salaries, Office and Official.
23. Legal Expenses.
24. Interest, Ordinary.
25. Sundries (general expense).

INCOME FROM OPERATION :

- 26. Arc-lighting, Street.
- 27. Arc-lighting, Commercial.
- 28. Incandescent Lighting, Street.
- 29. Incandescent Lighting, Commercial.
- 30. Incandescent Lighting, Residence.
- 31. Power, Stationary Motors.
- 32. Power for Street Railways.
- 33. Rent of Motors.
- 34. Rent of Meters.

PROFIT AND LOSS ACCOUNTS :

- 35. Rebate.
- 36. Miscellaneous Income.
- 37. Shop.
- 38. Profit and Loss.
- 39. Interest, Due and Accrued, Coupon Account.
- 40. Dividends Declared.
- 41. Depreciation on Machinery and Franchise.

BALANCE-SHEET ACCOUNTS :

Construction Accounts :

- 42. Land.
- 43. Station and Buildings.
- 44. Motive Power.
- 45. Arc Apparatus.
- 46. Incandescent Apparatus.
- 47. Power Apparatus.
- 48. Pole-lines.
- 49. Installations.
- 50. Conduits.
- 51. Cables.

*Resources:**Representative Accounts :*

- 52. Franchise and Patents.
- 53. Customers.
- 54. Suspense.
- 55. Store.
- 56. Open Accounts Receivable.
- 57. Bills Receivable.
- 58. Investments.
- 59. Sinking-fund.
- 60. Insurance Advanced.
- 61. Cash.

	<i>Representative Accounts :</i>
	62. Capital Stock, Issued.
	63. Bonds, Mortgage Account.
	64. Audited Vouchers Payable.
	65. Open Accounts Payable.
	66. Bills Payable.
<i>Liabilities:</i>	67. Wages Payable.
	68. Rents Payable.
	69. Taxes Payable.
	70. Interest, Coupon Account, Payable.
	71. Dividends Payable.
	72. Surplus.

SCHEDULE A.

Ledger Accounts.

1. Manufacturing, including 1, 2, 3, 4, 5, 6, 7.
2. Distribution, including 8, 9, 10, 11, 12, 13, 14, 15, 16.
3. General Expense, including 17, 18, 19, 20, 21, 22, 23, 24, 25.
4. Income from Operation, including 26, 27, 28, 29, 30, 31, 32, 33, 34.
5. Rebate, 35.
6. Miscellaneous Income, 36.
7. Shop, 37.
8. Profit and Loss, 38.
9. Interest, Due and Accrued, Coupon Account, 39.
10. Dividends Declared, 40.
11. Depreciation, 41.
12. Construction, including 42, 43, 44, 45, 46, 47, 48, 49, 50, 51.
13. Franchise, 52.
14. Customers, 53.
15. Suspense, 54.
16. Store, 55.
17. Open accounts with different debtors, 56.
18. Bills Receivable, 57.
19. Investments, 58.
20. Sinking-fund, 59.
21. Insurance, 60.
22. Cash, 61.
23. Capital Stock, 62.

24. Bonds, Mortgage Account, 63.
25. Audited Vouchers, 64.
26. Open accounts with different creditors, 65.
27. Bills Payable, 66.
28. Wages Payable, 67.
29. Rents Payable, 68.
30. Taxes Payable, 69.
31. Interest, Coupon Account, Payable, 70.
32. Dividends Payable, 71.
33. Surplus, 72.



SCHEDULE B.

Ledger Accounts.

1. Repairs to plant, including 1, 2.
2. Labor (on manufacturing), 3.
3. Fuel, 4.
4. Oil and Waste, 6.
5. Sundries (manufacturing), including 5, 7.
6. Maintenance of Lines, Installations, Conduits and Cables,
Arc-lamps, Motors, and Transformers, including 8, 9, 10, 11.
7. Labor (distribution), 12.
8. Carbons, 13.
9. Arc-globes, 14.
10. Incandescent-lamp Renewals, 15.
11. Sundries (distribution), 16.
12. Maintenance of Real Estate and Buildings, 17.
13. Labor (general expense), 18.
14. Rents, Taxes, and Insurance, Due and Accrued, including
19, 20, 21.
15. Salaries, Office and Official, 22.
16. Sundries (general expense), including 23, 24, 25.
17. Arc-lighting, including 26, 27.
18. Incandescent Lighting, including 28, 29, 30.
19. Power, including 31, 32.
20. Rent of Motors and Meters, including 33, 34.
21. Rebate, 35.
22. Miscellaneous Income, 36.
23. Shop, 37.
24. Profit and Loss, 38.
25. Interest, Due and Accrued, Coupon Account, 39.

26. Dividends Declared, 40.
27. Depreciation, 41.
28. Real estate and buildings, including 42, 43.
29. Motive-power plant, 44.
30. Electrical plant, including 45, 46, 47.
31. Distributing system, including 48, 49, 50, 51.
32. Franchise, 52.
33. Customers, 53.
34. Suspense, 54.
35. Store, 55.
36. Open accounts with different debtors, 56.
37. Bills Receivable, 57.
38. Sinking-fund, 59.
39. Insurance Advanced, 60.
40. Cash, 61.
41. Capital Stock, Issued, 62.
42. Bonds, Mortgage Account, 63.
43. Audited Vouchers, 64.
44. Open accounts with different creditors, 65.
45. Bills Payable, 66.
46. Wages Payable, 67.
47. Rents and Taxes Payable, including 68, 69.
48. Interest, Coupon Account, Payable, 70.
49. Dividends Payable, 71.
50. Surplus, 72.

SCHEDULE C.

Ledger Accounts.

1. Manufacturing, including 1, 2, 3, 4, 5, 6, 7.
2. Distribution, including 8, 9, 10, 11, 12, 13, 14, 15, 16.
3. General Expense, including 17, 18, 19, 20, 21, 22, 23, 24, 25.
4. Operating Income, including 26, 27, 28, 29, 30, 31, 32, 33, 34, 35.
5. Miscellaneous Income, including 36, 37.
6. Profit and Loss, 38.
7. Construction, including 42, 43, 44, 45, 46, 47, 48, 49, 50, 51.
8. Franchise, 52.
9. Customers, 53.
10. Open accounts with different debtors, 56.
11. Cash, 61.
12. Capital Stock, 62.

13. Bonds, Mortgage Account, 63.
14. Audited Vouchers, 64.
15. Open accounts with different creditors, 65.
16. Bills Payable, 66.
17. Wages Payable, 67.
18. Rents, Taxes, Insurance, Payable, including 68, 69, 70.
19. Surplus, 72.

DISPOSAL OF ACCOUNTS.

*Charged with**Credited with**All operating-expense accounts (1-25).*

Cash, Audited Vouchers, Store, Bills Payable.	|	Close to debit of Profit and Loss.
--	--	---------------------------------------

All operating-income accounts (26-34).

Rebate. Close to credit of Profit and Loss.	|	Customers.
---	--	------------

Rebate (35).

Customers.	|	Close to debit of Operating Income, or Profit and Loss.
------------	--	--

Miscellaneous Income (36).

Close to credit of Surplus.	|	Cash, Open Accounts Receiv- able, Bills Receivable.
-----------------------------	--	--

Shop (37).

Cash, Labor, Store. Close to credit of Profit and Loss.	|	Customers.
---	--	------------

Profit and Loss (38).

Suspense, Operating Expenses. Close to credit of Surplus.	|	Income from Operation, Shop.
--	--	------------------------------

Interest, Due and Accrued, Coupon Account (39).

Interest Payable.		Close to debit of Surplus.
-------------------	--	----------------------------

Dividends Declared (40).

Dividends Payable.		Close to debit of Surplus.
--------------------	--	----------------------------

Depreciation (41).

Construction accounts (42-51). Franchise and Patents.	|	Close to debit of Surplus.
--	--	----------------------------

*Charged with**Credited with**All construction accounts (42-51).*

Cash, Audited Vouchers, Stock, Bonds, Bills Payable.	Close to debit of Balance ac- count.
---	---

Franchise and Patents (52).

Cash, Audited Vouchers, Stock, Bonds.	Close to debit of Balance ac- count.
--	---

Customers (53).

Income accounts of all custom- ers (26-34).	Cash, Bills Receivable, Rebate, Suspense. Close to debit of Balance ac- count.
--	---

Suspense (54).

Customers.	Close to debit of Profit and Loss or to Balance account.
------------	---

Store (55).

Cash, Audited Vouchers, Bills Payable.	Construction, Operating Ex- pense. Close to debit of Balance ac- count.
---	--

Separate open accounts receivable (56).

Sundries.	Cash, Bills Receivable, etc. Close to debit of Balance ac- count.
-----------	---

Bills Receivable (57).

Sundry customers' accounts, etc., notes taken for.	Cash, discount, etc. Close to debit of Balance ac- count.
---	---

Investments (58).

Cash, sundry securities.	Close to debit of Balance ac- count.
--------------------------	---

Sinking-fund (59).

Cash.	Close to debit of Balance ac- count.
-------	---

*Charged with**Credited with**Insurance Advanced (60).*

Cash, always paid in advance.	Insurance, Due and Accrued. <i>Close</i> to debit of Balance account.
-------------------------------	--

Cash (61).

All receipts of cash from any source.	All payments of cash for any purpose. <i>Close</i> to debit of Balance account.
---------------------------------------	--

Capital Stock, Issued (62).

<i>Close</i> to credit of Balance account.	Cash, Bills Payable, Franchise, Construction, and Sundries.
--	---

Bonds, Mortgage Account (63).

<i>Close</i> to credit of Balance account.	Cash, Bills Payable, Franchise, Construction, Discount on Bonds.
--	--

Audited Vouchers (64).

Cash, Bills Payable, Sundries. <i>Close</i> to credit of Balance account.	Construction, Operating Expense, Store, Sundries.
--	---

Separate open accounts payable (65).

Cash, Bills Payable, Sundries. <i>Close</i> to credit of Balance account.	Construction, Operating Expense, Store, Sundries.
--	---

Bills Payable (66).

Cash, Discount account. <i>Close</i> to credit of Balance account.	Construction, Operating Expense, Store, Sundries.
---	---

Wages Payable (67).

Cash. <i>Close</i> to credit of Balance account.	Wages or Labor, Due and Accrued.
---	----------------------------------

Rents Payable (68).

Cash. <i>Close</i> to credit of Balance account.	Rents, Due and Accrued.
---	-------------------------

*Charged with**Credited with**Taxes Payable (69).*

Cash.		Taxes, Due and Accrued.
Close to credit of Balance account.	|	

Interest Payable, Coupon Account (70).

Cash.		Interest, Due and Accrued.
Close to credit of Balance account.	|	

Dividends Payable (71).

Cash.		Dividends Declared.
Close to credit of Balance account.	|	

Surplus (72).

Interest, Due and Accrued,		Profit and Loss.
Coupon Account; Dividends		Miscellaneous Income.
Declared.	|	
Close to Balance account.	|	

Schedule A is arranged for use with "Abstract Books" and contains only department headings, all details being entered in the "Abstracts." The numbers at the right indicate the numbers of the several accounts or subdivisions that are to be included under any one heading.

Schedule B has quite a number more accounts for the Ledger, but it is arranged to do away with the "Abstract Books," all entries being made directly from the Voucher Register or Journal. As above, the numbers at the right indicate the accounts to be included under each head.

Schedule C is for use by smaller-sized companies or where it is not deemed necessary to go much into detail and monthly reports are not required.

The number of departments and accounts has been condensed to the lowest limit felt desirable by the writer.

As care has been taken to describe each individual account and subdivision, it is not necessary to give other than the numbers of the individual accounts that are included.

CHAPTER X.

GENERAL BOOKS.

It is probable that the smaller stations will do best by keeping to the old style of Ledger, Journal, and Cash-book, merely changing the names of accounts in the Ledger, and perhaps adding a voucher blank, either one of Nos. 58 or 58A, according to the analysis chosen. Schedule C is recommended for use by these companies.

In the larger stations, such as may adopt the full analysis of schedules A or B, the old style of double entry requires an immense amount of writing, which can be very largely reduced by adopting the voucher system in full; it will not only save time, but the results are far more accurate as repetition of entry is to a great extent avoided.

The essential principle of it is that no separate accounts need be kept with individual creditors, excepting when many purchases are made during a month, or there is trading back and forth; in which case it is more convenient to keep a special open account for the creditor.

All invoices, after approval for quantity, order, prices, and extension, also approval for distribution, by the proper officials or persons, are credited to an account called "Audited Vouchers," which was carefully explained under that head on page 43.

This reduces the Ledger accounts and consequently the writing by almost the entire number of creditors. The Ledger is the same as ever, but may be much smaller as none but representative accounts are carried on it.

The Cash-book is very simple, and little change is necessary. Changes are suggested as follows, viz.: an extra column on the debit side for the entry of payments by customers, and another column for rebate on customers' accounts.

In connection with the collection of customers' accounts it is well to use Form No. 60A or something similar. It is made up by the collector on his return for the day, or by the cashier

FORM No. 60.
CASH-BOOK FOR ELECTRIC-LIGHTING STATIONS.
CASH RECEIVED.

[Left-hand side.]					
		Ledger Page.	Rebate.	Customers' Accounts.	
Amounts brought forward					

NOTE.—Convenient width of page, 10½".

						[Right-hand side.]	
		Voucher Number.	Ledger Page.	Audited Vouchers.	Open Accounts.		
Amounts brought forward....							

CASH PAID.

in the office for any moneys received during the day on account of customers. It is signed by the collector, approved by the cashier or bookkeeper for items and extensions, approved for deposit in a stated bank, and the amount must appear on the deposit-slip and in the Bank-book, only one of these amounts being entered on a deposit-slip.

Trouble between bookkeepers, cashiers, and collectors is saved by the use of this form, as each approves the paper over his own signature, and the record follows clear to the Bank- and Cash-books.

Rebate is really a Journal entry, but is much handier made on the same book and at the same time as the cash payments.

At the end of the month or week, as the routine of the office may be, the total of the column of payments by customers is credited to "Customers" in the General Ledger, the separate items being also posted to the credit of the several customers in the "Customers' Ledger" or "Register," rebate items also being posted at the same time.

The footing of the rebate column is credited to "Customers" and charged to "Rebate." This latter entry can be made direct or through the Journal, as seems most fit.

On the credit side of the Cash-book, columns are added for "Voucher Number," for "Audited Vouchers," and another for general payments.

The payment of any audited voucher is entered to the credit of Cash by name, number, and amount, all items being entered in their proper columns. At the end of the month the total footing of the "Audited Vouchers" column is entered in the Ledger to the debit of that account, the balance of which then shows the amount owed sundry creditors.

All payments to persons or firms having open or running accounts are entered in the columns for general payments and posted by item to the debit of their accounts on the Ledger.

What is usually called the Journal now becomes the Voucher Register, and is the Journal spread out so as to give room for separate columns for each of the regular representative accounts, as well as facilities for introducing any other entries that may be required.

A sample ruling for this book is shown in Form No. 61; it can be used very conveniently as a Journal, and will do for use with any one of the three schedules of accounts. When

[Page No. as usual.]

FORM NO. 61.
VOUCHER REGISTER.
DEBITS.

[Left-hand side.]

Construction.	General Expense.	Distribution.	Manufacturing.	Store Debit.	Sundries.	Ledger Page.

Month of..... 189 .

CREDITS.

[Right-hand side.]

Date.	Voucher Number.	Ledger Page.	Audited Vouchers.	Open Accounts.	Date Paid.

[NOTE.--Convenient size page, 10 1/2 x 16.]

used in connection with Schedule A it is necessary to have a couple of "Abstract Books," one for "Operating Expenses" and "Construction," and another for the "Operating Income," in order to show the items of expense or income under the proper heading and in convenient form. For this purpose forms Nos. 62 and 63 are shown. In using the last three forms, the totals for the different departments are entered in the Voucher Register (Form No. 61) from the Vouchers for debits and from the Customers' Ledgers for credits, and the separate items are then entered from the same two sources under the subheads on the "Abstract Books" (forms Nos. 62 and 63).

The routine is somewhat as follows: each invoice, after approval by all the proper persons as to price, quantity, order, etc., is entered on and attached to a voucher blank (No. 58 or 58A, according to which schedule is chosen), and the amount is distributed among the various accounts as listed on the back of the voucher. Both the voucher and attached invoice then go to the proper officials, say the general manager, auditor, or perhaps executive board, for approval and signature. This removes all responsibility from the accountant for everything but proper entry on the books as per the distribution which has been officially approved.

This approved voucher is now used as a list, and each of the items is entered under its appropriate heading in the Voucher Register (No. 61), and the total amount is credited to "Audited Vouchers" or to the special open account, according to its nature. The name of the creditor is written in its proper place, and a consecutive number given the voucher by which it is known in all future transactions.

The voucher with the invoice attached is then used in the usual manner for settling the account, and it is best that both be receipted at payment. Some accountants separate the two, reserving and filing the original invoice, and forwarding the voucher alone for receipt. This last method renders the auditor's work more difficult than when both are kept together, as the original invoice must be examined. All pay-rolls and other labor payments must be treated as invoices, a voucher made out for each, and the items distributed as for any outside account.

Whenever a voucher is paid the item is entered in "Cash" by name, number, and amount, as previously stated, and the date of such payment is also set against the number of the

[illegible]

ABSTRACT OF

[illegible]

voucher in a column provided for the purpose on the "Register."

At the end of the month, after all vouchers have been entered in the "Register," the columns should all be footed and proved: the sum of all the debit footings should equal the sum of the footings of the two columns of "Open Accounts" and "Audited Vouchers."

The posting of these footings to the various accounts in the Ledger is then done, and the trial balance is the work of but a few moments.

Only the footings in No. 61 are posted when that and the "Abstract Book" are used, as the "Abstract" is only used to show the items of which the main accounts are made up, and to save entering so many items on the Ledger.

It will be readily understood that on the credit side of the Voucher Register only the footing of the "Audited Vouchers" column is posted as a whole, as the "Open Accounts" column is made up of separate items, each of which must be posted to its respective account. In making transfers of items from one account to another, either by reason of a wrong entry or otherwise, it is better to have a voucher of a different color than the regular one, and the change of entry should be approved by some official before posting. Such change can then either be made by entry in the general columns of the "Register" or by entering in the column to which it is to be charged, as usual, and in the column from which it is to be taken in *red ink*, as all red-ink entries may be considered deductions from columns in which they are made.

If a cash payment is made on account and not in full settlement, receipt for it is taken on a simple slip like No. 64, following, and this receipt is given the same number as the last voucher that is included in such part payment, with a letter affixed to the number, as follows: "Voucher No. 316A." In case such partial payment is on account of an "Audited Voucher" it will probably save trouble if the account is at the same time transferred to the Ledger as an "Open Account," thus saving several small entries on the "Register."

The footings of the "Customers' Registers" are entered every month in the "Abstract of Income" (Form No. 63), each item under its proper heading, and the total of all only is posted in

OPERATING EXPENSE AND CONSTRUCTION.

voucher in a column provided for the purpose on the "Register."

At the end of the month, after all vouchers have been entered in the "Register," the columns should all be footed and proved: the sum of all the debit footings should equal the sum of the footings of the two columns of "Open Accounts" and "Audited Vouchers."

The posting of these footings to the various accounts in the Ledger is then done, and the trial balance is the work of but a few moments.

Only the footings in No. 61 are posted when that and the "Abstract Book" are used, as the "Abstract" is only used to show the items of which the main accounts are made up, and to save entering so many items on the Ledger.

It will be readily understood that on the credit side of the Voucher Register only the footing of the "Audited Vouchers" column is posted as a whole, as the "Open Accounts" column is made up of separate items, each of which must be posted to its respective account. In making transfers of items from one account to another, either by reason of a wrong entry or otherwise, it is better to have a voucher of a different color than the regular one, and the change of entry should be approved by some official before posting. Such change can then either be made by entry in the general columns of the "Register" or by entering in the column to which it is to be charged, as usual, and in the column from which it is to be taken in *red ink*, as all red-ink entries may be considered deductions from columns in which they are made.

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The footings of the "Customers' Registers" are entered every month in the "Abstract of Income" (Form No. 63), each item under its proper heading, and the total of all only is posted in

FORM No. 64.

\$..... 189 .

RECEIVED OF BLANK ELECTRIC LIGHT AND POWER COMPANY,

.....Dollars,
in payment of.....

.....
Approved.....

NOTE.—This voucher should be made same size as the others, Nos. 72 and 74; convenient size is 4" x 9".

the Ledger to the Income and Customers' accounts. There are two advantages in this method: first, a comparative exhibit is made each month so as to bring it directly to one's notice; and, again, it saves all but one entry on the Ledger for this account, with all the necessary balancing, etc., of the numerous divisions.

CHAPTER XI.

MONTHLY SUMMARY STATEMENTS.

HAVING arranged a system so that complete records of all parts of the operation of a station may be kept, as well as a record of the financial transactions connected with the business, it is fitting that monthly or other periodical summaries should be made both of the financial end and of the operating end.

In Form No. 65 attempt is made to show all the items necessary to a clear understanding of the former, and in Form No. 66 of the latter part of the business. In the first, the list of operations will, of course, be printed according to the style of station; and the operating expenses may be given in as much detail as desired, or as little as is here shown. This form will show the net profit for the month, and the last item exhibits the profit for operating for the time up to the date stated, for the current fiscal year.

Form No. 66 is an output-statement summary together with an estimate of the unit operating expenses for the same. It shows, first, the output for arc-lamps, stated in arc-lamp hours and reduced to kilowatts; the output in incandescent-lamp hours, in kilowatt-hours, and in equivalent of arc-lamps; and the output in horse-power of motors, in kilowatts, and in equivalent of arc-lamps.

It is only necessary to use the equivalent of arc-lamps in cases where more than one standard of arc-lamp is used; in such cases the only difference in cost of arc-lamps of the different standards being in the fuel and carbons consumed, all the other items of expense being in such case charged up per arc-lamp hour.

Next are shown the various operating expenses for all, separating them into the direct charges, i.e., those specific items that only belong in one department, as carbons in arc-lamp depart-

FORM No. 65.

BLANK ELECTRIC LIGHT AND POWER COMPANY.

FINANCIAL STATEMENT.

For the ending..... 189

Number of customers this date.									
Number of arc-lamps connected.....									
Number of incandescent lamps connected.....									
Number of 16-c.p. incandescent lamps equivalent.....									
Number of motors connected.....									
Total horse-power of motors connected.....									
Amount of audited vouchers and sundry open accounts payable.....									
Amount due from delinquent customers (not this month).....									
Amount due from sundry open accounts receivable.									
EARNINGS.—From arc-lamps....									
From incandescent lamps.....									
From motors. .									
From other operating sources..									
Total earnings from operation..									
EXPENSES.—Manufacturing.....									
Distribution..									
General expense									
Total expense of operation.....									
Net income from operation.....									
Income from sources other than operation.....									
Total income.....									
Fixed charges and depreciation.....									
<i>Net profit</i> for the month.....									
Net profit for — months ..									

Approved.....Secretary.

NOTE.—Convenient size, 8" x 10".

Summary of Operations for the month of _____ 189.

OUTPUT FOR THE MONTH.				EQUIVALENT IN KILOWATTS				EQUIVALENT IN ARC-LAMP-HOURS			
Lamp-hours, Arc.	c.p.										
Lamp-hours, Arc.	c.p.										
Lamp-hours, incandescents											
Electrical horse-power hours Motors											
Total output											

EXPENSES.

Direct charges											
Fuel											
All other expense											
Total operating expense for the month											
Total fixed charges and depreciation											
Total expense for the month											

OPERATING EXPENSE. ARC.

Direct charges, Carbons											
" Globes											
" All other arc supplies											
" Trimmers and other arc labor											
Total											
Fuel, proportion of											
Proportion of all other expense											
Total arc expense											
Operating expense per arc-lamp-hour											cts.
" " " kilowatt-hour											cts.
Fixed charges and depreciation per arc-lamp-hour											cts.

OPERATING EXPENSE. INCANDESCENT.

Direct charges, lamp renewals											
" Incandescent supplies											
" Inspectors and all other incandescent labor											
" Total											
Fuel, proportion of											
Proportion of all other expense											
Total incandescent expense											
Operating expenses per incandescent lamp hour											cts.
" " " kilowatt hour											cts.
" " " arc-lamp-hour											cts.
Fixed charges and depreciation per incandescent lamp hour											cts.

OPERATING EXPENSE. POWER.

Direct charges, supplies for electric power											
" labor											
" Total											
Fuel, proportion of											
Proportion of all other expense											
Total electric power expense											
Operating expenses per electrical horse-power per hour											cts.
" " " kilowatt hour											cts.
" " " arc-lamp-hour											cts.
Fixed charges and depreciation per electrical horse-power hour											cts.

Average life of incandescent lamps for the month _____ hours

RULE: Total lamp-hours of output of incandescent lamps ÷

Number of renewals = Life in hours

Remarks:

Signed, _____ Supt. _____

ment, or incandescent renewals for incandescent department, etc.; fuel, which in some cases has to be especially divided, and as it is a large item is well kept prominently in sight; and, lastly, all general expense, which is divided among the different departments *pro rata* by the amount of output in each.

Next come the Arc, Incandescent, and Power departments, with expenses in detail, stated per arc-lamp hour, per incandescent-lamp hour, per kilowatt-hour, and per electrical horse-power hour.

So far very few central stations have attempted to make any sort of statement similar to this, excepting in those cases of municipal plants where arc-lighting only is used, and even in those cases the actual accurate output is seldom kept so as to be available, it being most often stated in nights per year per lamp instead of hours per year and nights per year.

The blanks described in the other portions of this book can easily be made to show the output of a station, no matter how complicated it may be, and the classification of accounts is such as to readily show the total and detailed expenses as stated on this Form No. 66.

Until station-men more widely adopt some system of accounts that will show the accurate unit cost of work, they will never be able to improve to any great extent on the methods of manufacture at present in use.

It must be understood that the foregoing described method of accounting is not advanced as new, as similar ones have been in use for a long time by railroads and other large corporations; it has only been the object of the writer to try to adapt the methods to electrical-central-station work and to indicate a convenient classification and analysis of accounts for that purpose.

Next to steam-engineers it is probable that men of no occupation, profession, or trade cling more closely to old-fashioned methods, or such as they were first taught, as do bookkeepers; in fact very desirable changes in methods of accounting are frequently abandoned for the reason that they offend the bookkeeper in charge, and to break with him would often involve serious trouble with accounts.

The within-described system is extremely simple, and in many cases can be made to work with much less office force than any of the older methods, and is decidedly more easy for reference.

APPENDIX A.

BOOKKEEPING FOR ELECTRIC STREET RAILWAYS.

THE street railways having been so long organized and being strictly a cash business, the accounting is very simple when properly systematized. They have also been more or less under the supervision of State authorities, who have exacted reports which necessitated keeping the books on some stated classification.

It is doubtful if the analysis of railway accounts as set forth in the annual report of New York State can be much improved upon. It has time and again been used as a basis by companies in other States, and outside of a few new accounts, necessary after changing the motive power to electricity, there is little to be desired.

A chart is herewith presented (No. 70), which, while following the outline of the New York analysis, contains a few additions and changes which it is thought will be useful.

As in the central-station books, a few general headings are used, and these are again divided into subheads showing more detail.

The general books will be very much like those described for central-station use, excepting the change of headings.

The Ledger remains entirely unchanged. "Cash" does not need the columns for rebate, and the "Customers' Accounts" column here becomes "Passenger Earnings." The "Voucher Register" remains unchanged on the credit side, and the debit side is changed only as to headings. If "Abstract Books" are used (like No. 73), then the general heads as indicated by numbers on the chart are used for the Ledger, and the items coming under each such head are carried to the "Abstract Books" of the different departments.

The heads for the Register are as follows: construction, equipment, maintenance, power expense, transportation expense, general expense, sundries, and store.

FORM No. 70.

ANALYSIS OF ELECTRIC STREET RAILWAY ACCOUNTS.

1. Construction	{	Road-bed and track
	{	Electrical overhead construction
	{	Power plant
	{	Real estate and buildings
2. Franchise and right of way		
3. Equipment	{	Motor-cars and fixtures
	{	Trail-cars
	{	Other rolling-stock
	{	Miscellaneous equipment
Earnings	{	4. Earnings from operation { From passengers
	{	" advertising
	{	" sundry sources
	{	5. Sundry earnings outside of operation
	{	Buildings and fixtures
	{	Steam or water power plant
	{	Electrical plant in station
	{	Sundry power-plant equipment
	{	Road-bed and track
	{	Pavement
	{	Electrical overhead construction
	{	Cars and vehicles
	{	Motors, except gearing
	{	Gearing and trolleys
	{	Fuel
	{	Oil and waste
	{	Water tax
	{	Wages { Engineers, firemen, and laborers
	{	" Dynamo-men and mechanics
	{	General supplies
	{	Wages { Motor-men and conductors
	{	" Watchmen, starters, and switchmen
	{	" Track and line men
	{	Removal of snow and ice
	{	Damages to persons and property
	{	Salaries—officers and clerks
	{	Advertising and printing
	{	Legal expenses
	{	Insurance accrued
	{	Miscellaneous office expenses
	{	Franchise charges
	{	Rentals accrued
	{	Taxes " "
	{	License " "
	{	Interest on bonds accrued
	{	Tolls on bridges
	{	Depreciation on plant
	{	Dividends declared
7. Fixed charges, or deductions from net income from operation		
8. Profit and Loss account		
	{	1. Construction accounts
	{	2. Franchise and right of way
	{	3. Equipment
	{	9. Cash account
	{	10. Store account
	{	11. Open accounts
	{	12. Bills receivable
	{	13. Investments
	{	14. Sinking-fund
	{	15. Insurance advanced
	{	16. Surplus account
Balance-sheet accounts	{	17. Capital stock
	{	18. Bonds, mortgage account
	{	19. Rentals payable
	{	20. Taxes " "
	{	21. License " "
	{	22. Wages " "
	{	23. Interest " "
	{	24. Dividends " "
	{	25. Bills " "
	{	26. Audited vouchers payable

FORM No. 71.

CASH-BOOK FOR STREET RAILWAYS.

• CASH RECEIVED.

[Page No. as usual.]

[Left-hand side.]				
		Ledger Page.	Passenger Earnings.	
Amounts brought forward.....				

CASH PAID.		[Right-hand side.]		
		Voucher Number	Ledger Page.	Open Accounts.
Amounts brought forward....				

NOTE.—Convenient size page, 10½" x 16".

[Page No. as usual.]

FORM No. 72.
VOUCHER REGISTER FOR STREET RAILWAYS.

Month of.....189 .

DEBITS.

[Left-hand side.]									
General Expense.	Transporta- tion Expense.	Power Expense.	Maintenance.	Equipment.	Construction.	Store Debit.	Sundries.	Ledger Page.	

CREDITS.

[Right-hand side.]					
Date.	Voucher Number.	Ledger Page.	Audited Vouchers.	Open Accounts.	Date Paid.
	Amounts brought forward				

NOTE.—Convenient size of page, 12" x 16".

As the accounts are much like those of a central station, no attempt will be made to describe them here.

The type of Register is shown in No. 72, and abstracts are shown in No. 73 for "Construction," "Equipment," and "Operating Expense." Form No. 74 shows the form of voucher cover recommended for use with "Abstract Book" and Register.

A very good and full description of details for street-railway accounting will be found in "Street Railways," by C. B. Fairchild, New York.

Form No. 73.

VOUCHER.

Number and Date.

ABSTRACT OF OPERATING EXPENSES.

CONST

EQUI

Gearing and Trolley.	ous ent.	Other Rolling Stoc
----------------------------	-------------	-----------------------



POWER EXPENSE.

Wages,
ormen and
nductors.

General
Supplies.

Wages,
Dynamo-men,
Mechanics.

Wages, En-
gineers, Fire-
men, Laborers.

Water Tax.

Oil and
Waste.

Fuel.

BEONST

EQUI

Gearing and Trolley.	ous ent.	Other Rolling Stoc
----------------------------	-------------	-----------------------



BLANK STREET RAILROAD COMPANY.

CONSTRUCTION AND EQUIPMENT.

FORM No. 74.

.....189

THE BLANK STREET RAILROAD COMPANY,

To.....Dr.,
for the following items, the original invoices for which are attached.

RECEIPT ALL.

Approved for \$.....	Received of THE BLANK STREET RAILROAD COMPANY	..... 189
General Manager.	..... Dollars,	
Approved,	in full payment of the above account.	
.....	

NOTE.—Convenient size, 8" x 9".

第 1 章 関数とグラフ

1.1 関数の定義

関数とは、ある集合 X から別の集合 Y へ対応させる規則のことである。このとき、 $x \in X$ が $y \in Y$ に対応することを $y = f(x)$ と表す。



FORM No. 74.

.....189

THE BLANK STREET RAILROAD COMPANY,

To.....Dr.,
for the following items, the original invoices for which are attached.

RECEIPT ALL.

Approved for \$.....	Received of THE BLANK STREET RAILROAD COMPANY	..... 189
.....	..... Dollars,	
General Manager.	in full payment of the above account.	
Approved,	.....
.....		

NOTE.—Convenient size, 8" x 9".

[Indorsement.]

Register Folio... .. Voucher No.....
 C.-B. Folio ... Date paid..... 189 .
 In favor of

Chargeable to

CONSTRUCTION.

1. Road bed and track.....
2. Electrical overhead construction...
3. Power plant
4. Real estate and buildings.....

EQUIPMENT.

5. Motor-cars and fixtures
6. Trail-cars.....
7. Other rolling-stock.....
8. Miscellaneous equipment.....

MAINTENANCE OF

9. Buildings and fixtures.....
10. Steam or water power plant
11. Electrical plant in station... ..
12. Sundry power-plant equipment....
13. Road-bed and track
14. Pavement... .. .
15. Electrical overhead construction..
16. Cars and vehicles.....
17. Motors, except gearing.....
18. Gearing and trolleys.....

POWER EXPENSE.

19. Fuel.....
20. Oil and waste
21. Water tax.....
22. Wages—engineers, firemen, laborers
23. Wages—dynamo-men and mechanics
24. General supplies.....

Amounts forward.....

Amounts brought up.....

TRANSPORTATION EXPENSE.

25. Wages—motor-men and conductors..
26. Wages—watchmen, starters, and
switchmen.....
27. Wages—track and linemen.....
28. Removal of snow and ice.....
29. Damage to persons and property....

GENERAL EXPENSE.

30. Salaries—officers and clerks.....
31. Advertising and printing.....
32. Legal expense.
33. Insurance accrued.....
34. Miscellaneous office expenses
35. Franchise charges.. .. .

SUNDRY ACCOUNTS.

Total of this voucher.....

Distribution approved,

PART II.

SUGGESTED FORMS.

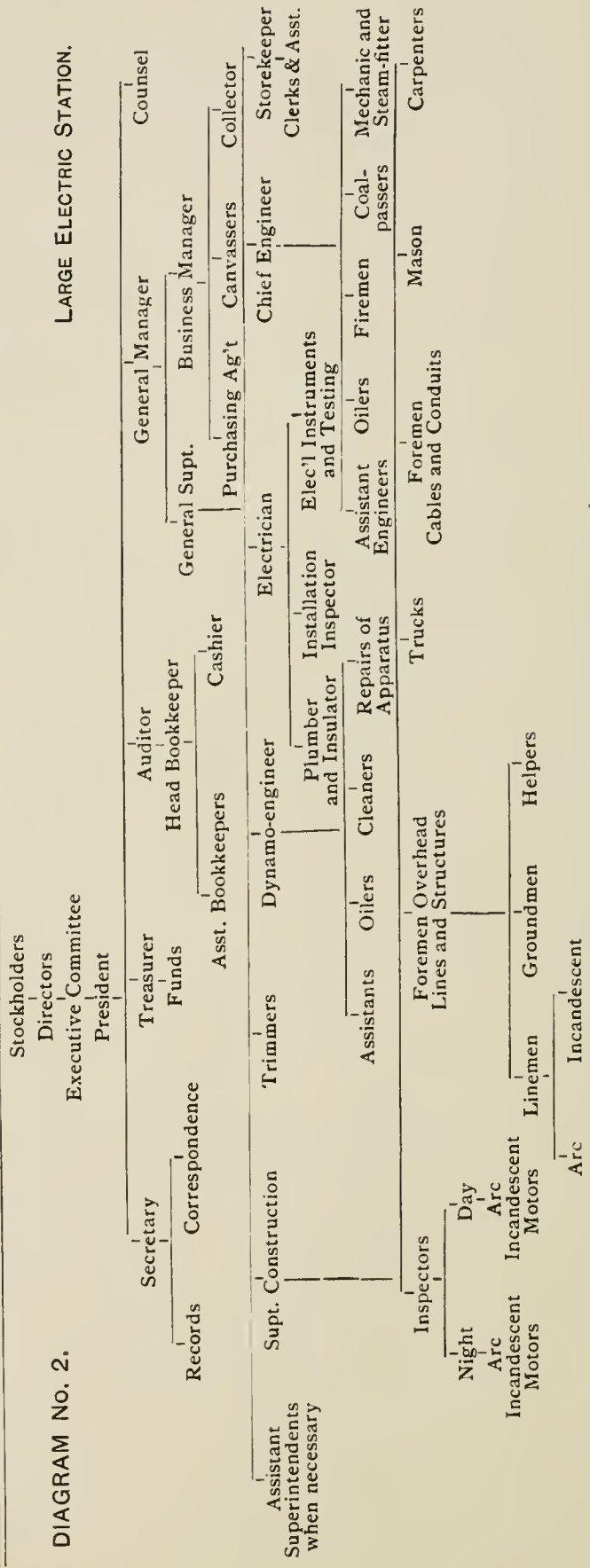
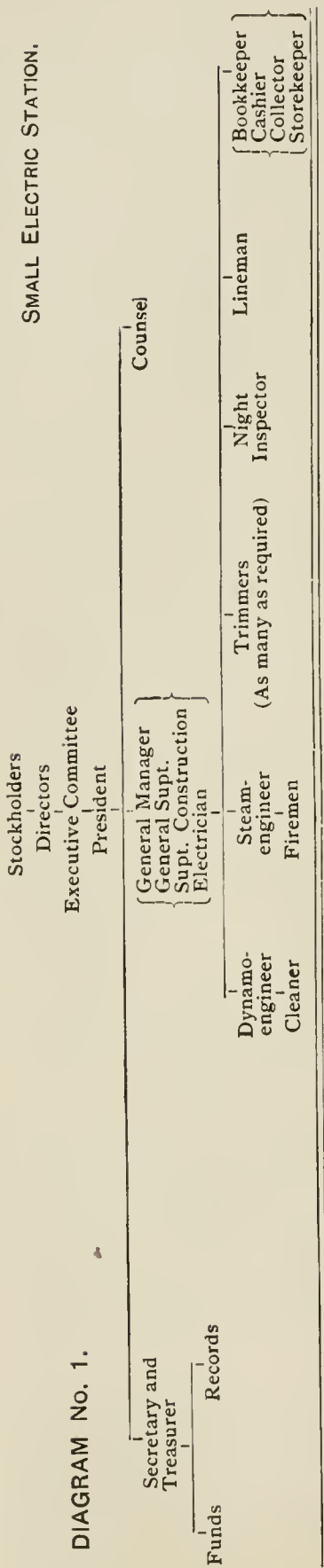
IN starting on this book the writer was much puzzled to decide which part to place first, the "Accounting" or "Suggested Forms," as both parts are of a necessity started at the same time; but as the "Accounting" is of a more definite nature it is placed first, this the second part being devoted to the "Suggested Forms."

While the within-described forms are not, perhaps, the ideal in every case, they are the outcome of much tedious work on hundreds selected from a very wide collection, and are certainly useful, having the added advantage of adhering to a systematic plan from which any data relating to the output or expense may be compiled.

Contrary to what will doubtless be the opinion of the majority of readers, the forms are, by a considerable number, less numerous than the list in use in most of the larger stations.

The first matter to be considered after the formation of a lighting company is, of course, the organization of its official force and employés. Such organization will depend much on local conditions, but the variation is not so very much, excepting as between the small, medium-sized, and large companies. Diagrams Nos. 1 and 2 show schedules of organization that have been found quite desirable for some time, and any slight variation from them will make no difference.

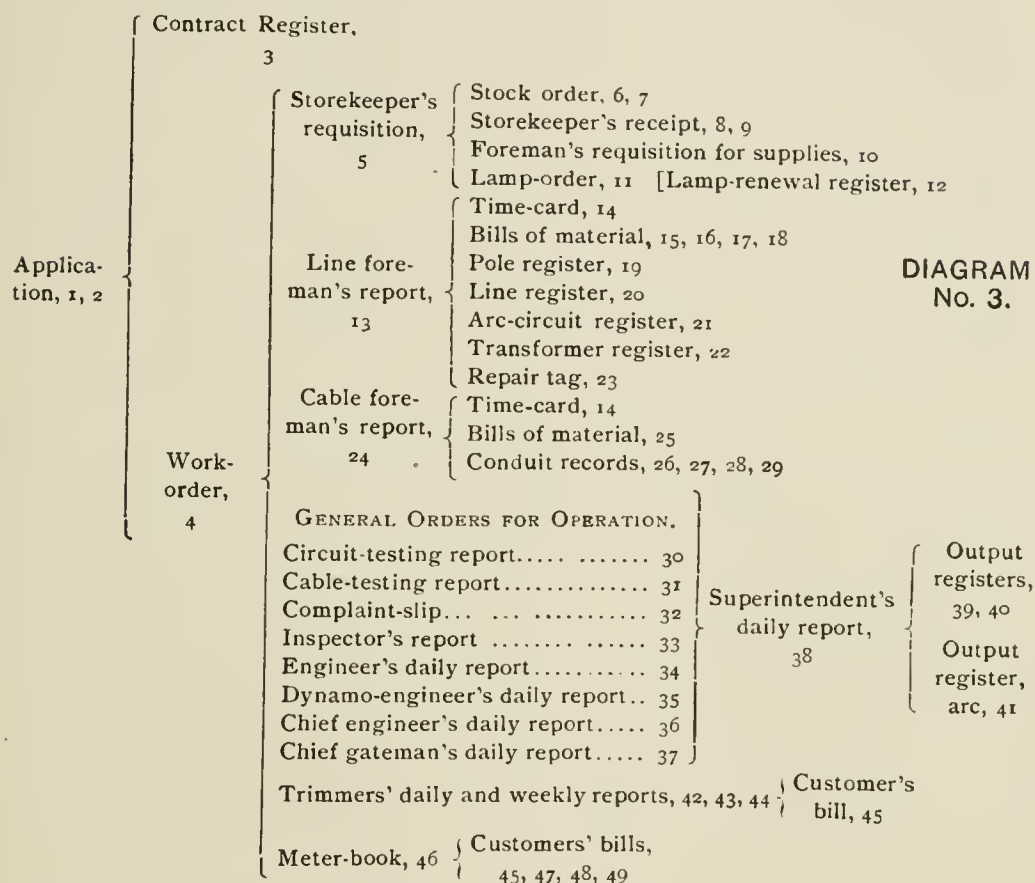
The organization and discipline of the working force will take a little time, but the start may as well be systematic as otherwise. As the forms here shown are expected to cover a large part of the field of central electric stations, with the exception of all storage-battery features, and as it is not positively



PLANS OF ORGANIZATION FOR ELECTRIC-LIGHT STATIONS.

necessary to follow any prescribed form or method of using any of them, each blank is separately described.

The following diagram (No. 3) is introduced to show an approximate outline of a system to follow in using the forms:



Supposing the company to be ready for business, its general books selected, force organized, etc., the next and most necessary thing is to get work for it to do: this comes in the form of applications for a supply of current made out on Form No. 1, No. 2 being used only for applications for increase of the original supply.

The application being accepted by the proper official of the company becomes a contract, and as such must be entered and recorded on the "Contract Register" (No. 3).

The superintendent makes a "Work-order" (Form No. 4) from the main items of the contract, and issues it to a construction foreman for execution. Previous to the above, however, it is necessary that the supplies for executing an order of installation of equipment should have been provided for the storekeeper: the storekeeper, using his requisition (Form No. 5), calls the attention of the proper officials to the need of such

supplies, and the material is ordered by the general manager or other official attending to the purchasing, using forms No. 6 or No. 7 as may be the most convenient, the latter being mostly for use for petty local supplies. When the material is received at the storehouse it is acknowledged by the storekeeper on Form No. 8, which is used for checking up orders, invoices, etc. Form No. 9 is used merely for such small sales of material as may be made to outsiders.

The supplies being provided, the line foreman or other construction-man orders the material he needs from the storekeeper, using Form No. 10; and it is better that but one item be written on a card. "Lamp-order" (No. 11) is used by customers for ordering new incandescent lamps to replace those destroyed; these orders, being a receipt as well, are used for charging up to the customers' accounts on the Ledgers in case lamps are not supplied free, and are then recorded on the "Lamp-renewal Register" (Form No. 12) so that all the various data relating to lamp renewals may be available.

During the progress of installation of equipment the "Line Foreman's" or "Cable Foreman's" reports (forms Nos. 13 and 24) are filled up and turned in daily, together with the time-cards for each employé (Form No. 14).

At its completion a bill or bills of material (see forms Nos. 15, 16, 17, 18, 25) are made up as embodying the full and total cost of supplies and labor for each particular piece of work.

The "Pole Register" (No. 19), "Line Register" (No. 20), "Arc-circuit Register" (No. 21), and "Transformer Register" (No. 22) are used for recording any and all data concerning poles in place, line-wire strung, the course of circuits, and the equipment connected to them. Forms Nos. 26, 27, 28, and 29 are used in a similar manner for records of underground circuits. Repair tag (No. 23) is fully described farther on.

During the installation and recording of equipments the "General Orders" for operation are issued and the station force organized, ready to supply current to consumers.

Forms from No. 30 to 41, both inclusive, are used for reporting on these "General Orders"; each is explained under its own name.

Following the reports of operation of the plant come the reports for the amount of current supplied for any purpose, using for arc-lamp supply forms Nos. 42, 43, 44, and for incan-

descent or power supply, No. 46, and in some cases No. 42. The amount of supply of current is entered directly in the "Customers' Ledgers" from the above reports, and bills for the same are made from those books. Forms of customers' bills are shown in Nos. 45, 47, 48, and 49.

In connection with the books and forms here described, the one feature on which it is desired to lay the most stress and to bring prominently before the mind of the reader is the great value of knowing the unit costs of the supply of current. Not only is it desirable to know the total cost per electrical unit, but of each and every item going to make up that cost. By many it is deemed impossible to do this with sufficient accuracy; but when one considers that the stoppage of the entire business for a week, without any deduction or consideration of such fact in the calculations, would be an error of less than two per cent figured for the year, it is seen that accuracy sufficient for all purposes is easily attained, as the combined stoppages of all the daily reports would scarcely amount to a week's shut-down of the whole station.

While the kilowatt is the unit most generally in use, and is the one positively necessary for electricians, it is quite desirable that some less technical unit be used in connection with it for the convenience of the company officials. Arc-lamp hour is easily understood by the layman, and is easily convertible from or to kilowatts. Incandescent-lamp hour is also a practical term and easily convertible, and as many companies sell current on the lamp-hour basis it is a very convenient unit for use. All the above terms are comparable with each other and are easily understood. Where arc-lamps of different candle-power are used it is necessary to use the arc-hour unit; for the expenses are almost the same for any size of lamp, with the exception of fuel and carbons,—the latter sometimes being the same cost for any of the lamps,—as the cost of small sizes may be made up by a better quality used.

Application (forms Nos. 1 and 2). — This blank takes the place of the large and formidable-looking document so often used as a contract with customers.

As a simple application becomes a contract when the conditions are fulfilled, it is in the opinion of the writer useless to frighten prospective customers by the sight of such legal-appearing documents as are generally used.

Form No. 1 is thought to cover all points not subject to special conditions, and it can be used for nearly all kinds of service.

Should a customer apply for an increase in his supply of current, it is not well to destroy the first contract ; it is only necessary to have him sign the "Increase Application" (Form No. 2), which should then be filed with the original application. It is convenient to have No. 2 printed on paper of a different color from the other, in order better to distinguish them.

Contract Register (Form No. 3).—This book is used for recording "Applications" for current (forms Nos. 1 and 2) after they have been accepted by the proper official and have thus become contracts. Columns are provided for the contract number; date; name and address of customer; term of contract; date started service; date contract expires; rate per unit; and columns for the proper distribution of equipment: this last can be recapitulated, showing the amount of apparatus of all kinds connected for service. Wiring of buildings and the installation of all apparatus, excepting perhaps arc-lamps and transformers, is gradually working into the hands of electrical contractors, the station companies furnishing only the street-service connection and current. In smaller cities and towns this is not yet the case, however, and it is therefore well to keep the cost of the installation on the same contract-book. Columns have been provided for this purpose. Everything from the outside line to and into the building should be included in this cost, transformers and arc-lamps being included in the list. The writer is much in favor of charging the labor and smaller items directly to "Expense," in case the whole installation is not paid for by the customer.

Work-order (Form No. 4).—In order that all expenditure may be charged to the proper account, it is necessary to designate in some manner the work that is to be done; for this purpose a written order should be issued for all work requiring material and labor, and all reference to that job should be made by the order number stated in that order.

General Orders for routine work should be issued by the superintendent when the system of reports is first introduced, and should be posted on a covered bulletin-board in a conspicuous position accessible to all the help. Each order is issued for a regular branch of the work, and the order number given

APPLICATION.

Number.....

Dated.....189....

Blank Electric Light and Power Company,

The Subscriber hereby requests you to place on the premises, No.Street, in such position as designated by.....
Electric Lights or as follows :

ARCS.	Nights per Week.	HOURS OF BURNING.		INCANDESCENTS.			MOTORS.			Period of Contract in Months from time of first starting.
		From	To	10 c.p.	16 c.p.	20 c.p.	32 c.p.	H.P.	H.P.	Fan.
		—M.	—M.							

and supply the above with electric current daily as above stated, for which..... agree to pay (monthly) at the rate ofcts, per night for arc-lamps, and cts, per .. .hour for current supplied through meter, or..... per month per incandescent lamp or motor if so supplied. It is understood and agreed that you are to furnish all apparatus, fixtures, and material for arc-lights, and make all connections from your main circuits to the building, also connections to circuits for incandescent lighting or motors. And it is agreed that all fixtures for incandescent lighting are to be furnished by.... and that the wiring will be in.....and is to be done by, and for which..... agree to pay at the rate of..... per lamp. This application is subject to the conditions printed on the back, and of which they are to be considered a part.

Accepted 189 ...
By
WITNESS. Signed.....
BLANK ELECTRIC LIGHT AND POWER CO.

AGENTS ARE NOT AUTHORIZED TO MAKE ANY AGREEMENT OR VERBAL PROMISE OUTSIDE OF THE TERMS OF THIS CONTRACT.

[Indorsement.]

Application No.....

Dated189

Name
..... Street.

Started Burning189

Expires189

Work-order No..... Issued189

CONDITIONS.

- 1st. That..... will exercise due care for the protection of the lamps and other equipments, and be responsible for the safe-keeping of the same inside the building, allowing no person access thereto, except your employés who show Company Badge.
- 2d. That if payment be not made as herein agreed, the whole amount of this contract shall thereupon become due and payable.
- 3d. That should the service of current be continued beyond the term of this contract fordays, and no notice of discontinuance be given in writing to said Blank Electric Light and Power Company, then it is understood and agreed that such continuance shall operate as a renewal of this contract for the same time and at the same prices as first contracted for.
- 4th. That all expense of alterations in the position of the lamps or other equipments made at..... request shall be paid for by.....
- 5th. That any failure on the part of the Blank Electric Light and Power Company to furnish said current shall not cancel this contract, nor render said Company liable for damages beyond a *pro rata* deduction from its bills for the actual time of such failure.
- 6th. That claims for non-service, to be valid, shall be made in writing to the manager within one week of the time when such non-service has occurred.
- 7th. That the Blank Electric Light and Power Company is hereby released from all claims on account of damage by fire when the placing of the lamps or other equipments inside the building is done in accordance with the rules of the Board of Fire Underwriters; and
- 8th. That the subscriber will grant to your Company all necessary privileges for introducing and maintaining said lamps or other equipments and wires; the placing of the lamps and equipments and furnishing lights by you is the consideration for..... agreement herein.

FORM No. 2.

INCREASE APPLICATION.



..... 189
The subscriber requests the Blank Electric Light and Power Company to install on premises No......
..... *in such position as* *will designate*
.....
this being in addition to..... *original application No.*..... *of* 189
and subject to the same regulations.

Accepted..... 189 *Signed*.....
BLANK ELECTRIC LIGHT AND POWER CO.
per..... *Manager.* *Witness*.....

[*Indorsement*]

Attach to application No.....

FORM No. 3.

CONTRACT REGISTER.

[Left-hand side.]

Number.	Contract Dated.		Name of Customer.	Street and Number.	Length of Term in Months.	First Started.		Expires.		Rate.
	Month.	Day.				Month.	Day.	Month.	Day.	

BLANK ELECTRIC LIGHT AND POWER COMPANY.

[Right-hand side]

Motors.			Arc-lamps.						Incandescent Lamps.					Installation.			Circuit Number.	Work-order Number.
			7 Nights.		6 Nights.		1 Night.		All Day.	All Night.	All Day.	All Night.	All Day.	All Night.	All Day.	All Night.	All Day.	All Night.
Number.	H. P., each.	Volts.	Maximum Amperes.	All Day.	All Night.	.0'clock.	.0'clock.	.0'clock.	All Day.	All Night.	.0'clock.	.0'clock.	.0'clock.	.0'clock.	.0'clock.	.0'clock.	.0'clock.	.0'clock.

NOTE.—Convenient size page, 10" x 11" in books 100 leaves, half bound, flexible back, ledger paper.

should thereafter be used on all time-cards and requisitions for materials used on that order. Following are a few of the more important divisions for which general orders should issue, viz.: steam-engine department; fire-room; dynamo-room; general repairs; trimming; inspecting; office. Other departments will suggest themselves in each case.

Orders for Installation or Removal should be issued on this same blank (No. 4), and if the business is large enough to warrant it, special rubber stamps should be made like diagrams *a, b, c, d*, herewith, which cover all necessary points and used on the blank make things plainer and save time.

DIAGRAM A.

Install on [remove from] premises of.....
 No..... Street, as per application number.....
arc-lamps..... [series lamps] ofc.p. to be placed outside [inside].
 To burn until o'clock M. days, for months.
 Start to burn on189 on circuit number.....
 Trimmer..... Inspector.....
 Recorded.....189 in Circuit Register.....page.....
 Lighting Register page by.....

DIAGRAM B.

Install on [remove from] premises of.....
 No..... Street, as per application number.....
c.p. incandescent lamps.
 To burn until o'clock M. days, for months,
 on meter [on contract] rates.
 Start to burn.....189 on main number.....
 Inspector.....
 Recorded.....189 in Circuit Register.....page.....
 Lighting Register page by.....

DIAGRAM C.

Install on [remove from] premises of.....
 No..... Street, as per application number.....
motor.....make volts H.P.
 Maximum current will be.....amperes.
 To run from o'clock M. to o'clock M. days, for months,
 on meter [on contract] rates.
 Start motor.....189 on circuit number.....
 Inspector.....
 Recorded.....189 in Circuit Register page
 Power Register page by.....

DIAGRAM D.

Make subsidiary connection with premises of.....
 No..... Street, as per application number.....
 Connect onto circuit No.....from [manhole] distributing-box located opposite No.....
 on.....side of..... Street,feet from curb.
 Recorded.....189 in Conduit Record.....page.....
 by.....

[The above diagrams, A, B, C, D, are for rubber stamps and must fit the blank space between *Signed* and *Signed on Work-order Form No. 4.*]

Storekeeper's Requisition (Form No. 5).—This blank is used by the storekeeper to notify the management of the need of material and supplies for the storeroom, which, after its approval by the general manager or other official, is authority for the order of the stated material by the proper official.

FORM No. 5.

No.	No.	REQUISITION.
Date.....	.....	.....189....
Order from	Mr.....	Superintendent.
.....	The following articles are needed from	
To be shipped via.....	To be shipped via.....	
ARTICLES WANTED.		
.....Storekeeper.		
Approved.....General Manager.		
Ordered .....189....		
Order No.....		

Stock-order (Forms Nos. 6 and 7).—Form No. 6 is to be used in ordering material after the approval of the requisition. It is most convenient when made with carbon duplicating-sheet, which saves one writing of the order. The column on the stub-sheet headed "Requisition Number" is to be filled in separately after tearing out the original. Form No. 7 is for use locally for petty supplies.

FORM No. 6.

No.189....

M.....

Please ship to us via.....

the following material :

Use the number of this order on your bill.

--	--

BLANK ELECTRIC LIGHT AND POWER COMPANY,
by.....



FORM No. 7.

No.....	BLANK ELECTRIC LIGHT AND POWER COMPANY.	No..... 189....
..... 189		M.....
To.....		Please deliver to.....
For		
By.....		.....Supt. Approved..... Preserve this order.

Storekeeper's Receipt for Supplies (Forms Nos. 8 and 9).—

The first of these is for use in notifying the office that certain supplies have been received at the storehouse, and is useful in checking up requisitions, orders, and invoices, one of the phrases "to apply on," "in completion of," being ruled off, whichever applies. Form No. 9 is a receipt taken by the storekeeper for any material furnished to outside parties.

FORM No. 8.

..... 189....

..... General Manager.

There has been received at the storehouse to-day the following material from

.....

on our Order No.....

To apply on [in completion of] Requisition No.....

.....Storekeeper.

FORM No. 9.

M..... 189....	DUPLICATE.	M..... 189 ...
.....	
Received in good order from		Received in good order from
BLANK ELECTRIC LIGHT AND POWER CO.		BLANK ELECTRIC LIGHT AND POWER CO.
Also received duplicate of this receipt. Delivered by ..... | Received by		Received by.....

Foreman's Requisition for Material (Form No. 10).—One of these blanks must be filled out for any material wanted of the storekeeper, and by the signature of the person ordering it becomes the storekeeper's receipt for the same.

In every case the "Work-order" number or other designation of the job must be stated, so that the material may be charged to the proper person or account.

It is much the best to make but one entry on a blank.

In some cases it is well to have an additional line below the foreman's signature, as follows: "Approved, , General Manager [or Superintendent]."

FORM No. 10.

BLANK ELECTRIC LIGHT AND POWER COMPANY.

.....189....

STOREKEEPER:

Deliver to the bearer for use on Order No..... or
.....

Signed.....Foreman.

Lamp-order (Form No. 11).—This blank answers for both order and receipt when filled out and signed by the customer. If lamp renewals are charged for, the number and value can be charged directly to the customer's account, and the number and size of lamps entered in the renewal register (No. 12).

FORM No. 11.

LAMP-ORDER.

.....189

M.....

No.....Street.

Candle-power.	8	10	16	20	25	32		Total.
Returns.....								
Style.....								
Wants.....								
Style....								

Received the above lamps ato'clock.....189....
Signed.....

Lamp-renewal Register (Form No. 12).—This record affords all data for determining the following results, viz.: the monthly number and value of renewals; the customers who require the most renewals; the time of year in which the highest

breakage occurs; the proportion of renewals to the number connected; and a basis for calculating the average life of all lamps. A column for the number of lamps connected is included in each month to care for any changes taking place during that time. The book can be made with a clipped leaf so that the names need be written but once a year.

FORM No. 12.

INCANDESCENT-LAMP RENEWAL REGISTER.

[Left-hand page.]

Name of Consumer.	Total Lamps Wired.	Month of.....							Total Lamps Wired.	Month of.....							Total Lamps Wired.	Month of.... . .						
		Number of each Candle-power.								Number of each Candle-power.								Number of each Candle-power.						
		10	16	20	25	32	50	65		10	16	20	25	32	50	65		10	16	20	25	32	50	65
Am'ts bro't forward. }																								

[Right-hand page.]

Total Lamps Wired.	Month of.....							Total Lamps Wired.	Month of.....							Total Lamps Wired.	Month of.....							* Remarks.
	Number of each Candle-power.								Number of each Candle-power.								Number of each Candle-power.							
	10	16	20	25	32	50	65		10	16	20	25	32	50	65		10	16	20	25	32	50	65	

* This leaf can be clipped off here so that names need be written but once a year.

Line Foreman's Report (Form No. 13).—This blank is to be filled out by line foremen on all construction of or repairs to pole-lines in all cases where the job cannot be completed in one day, and the time and expense entered on the regular "work-order." When the job is finished the last one of these reports must be attached to the "work-order" issued for the job and the whole turned into the office. The clerk will then enter all the reports, including the last one, on the "work-order," which will thus have a complete record of the cost of that particular job. Time-tickets with this job number can also be checked off by the line foreman's reports.

FORM No. 13.

BLANK ELECTRIC LIGHT AND POWER COMPANY.

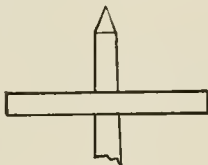
REPORT OF LINE FOREMAN.

Order No.

Weather at 12 o'clock noon... ..

No. Holes Dug.	No. Poles Erected [Removed].	Height above Ground.	Cross-arms put on.					Location on Street.			EMPLOYÉS.	
			2- pin.	4- pin.	6- pin.	8- pin.	10- pin.	From	To	Side.	No.	
												... Foreman hrs. @ ...
												... M : " "
												... Men " "
												... Men " "
												... Men " "
												... Trucks " "

No. Feet Wire Strung [Removed].	B. & S. Gauge.	Type of Insulation.	New Cir- cuit Number.	Attached to Circuit Number.	Location on Street.			EMPLOYÉS.	
					From	To	Side.	No.	
								... Foreman hrs. @...	
								... Climbers " " 	
								... Ground-men.. " " 	
								... " " 	
								... Trucks " " 	



Pole No.on.....side of
.....Street,
facing
Locate pins and wires on this diagram.

REMARKS.
.....
.....
.....
.....
.....
.....
Signed.... Foreman.

Time-card (Form No. 14).—This is a small ticket to be filled out by each employé each day and returned to the office, where it may be copied into a time-book, on the pay-roll, or filed away. Charge can also be made to the proper department for the man's time.

If he is engaged on routine or operation work he uses the number shown on the "general order" issued for that department; for any other work he uses the number of the "work-order" issued for the special purpose. A separate card must be made out for each job he has worked at during the day. Whlie this may seem an unnecessary trouble for small stations, it is a decided convenience, places the responsibility for the man's time, locates the expense, and makes a good reference.

It is more convenient to have "Construction" time-cards of different color from those for "Operation."

FORM No. 14.

Blank Electric Light and Power Company.

.....189

*Time-card for 24 hours ending 7 A.M., this
date.*

THIS CARD MUST BE IN OFFICE BEFORE 8 A.M.

Name.....

Occupation.....

MAKE BUT ONE ENTRY ON THIS CARD.

Location of Job. [Order Number.]	Hours Regular.	Hours Extra.	Rate.	Amount.

Approved,

.....Foreman.

Forms Nos. 15, 16, 17, 18, and 25 are bills of material used on installations of various kinds, and are to be attached to and returned with the work-order issued for the installation or removal.

Pole Register (Form No. 19).—This will be found a most convenient record. A careful survey should be made and all the points filled in as per headings. From this record the length of any circuit and the length of wire necessary for new ones can be calculated, and an inventory of the entire pole-line made to a nicety.

Care should be taken to number consecutively all the poles on each street, starting at the end nearest the station or main line; this assists in hunting a pole when only the street name is given.

Poles should be entered under the proper street heading,

according to consecutive number, and four or five lines left for future changes. If poles are inserted in the line between numbers, they can be lettered after the first number: say the new pole is between poles 54 and 55, then call it No. 54*a*.

Line Register (Form No. 20).—This book is for the purpose of registering the location of circuits on poles, and has a diagram of all attachments to every pole where there is any change made in the direction or location of wires.

This record should always be kept complete and revised, whether ever used outside the office or not, as it avoids trouble from the sudden leaving of the only lineman who carries the combination in his head.

Arc-circuit Register (Form No. 21).—This book should be used in every station having more than two circuits, and is a positive necessity in very large stations. The form herewith covers about all points necessary to know about an arc-circuit, and if a map is used for each circuit in connection with this book the record will be very complete. It shows location of and make-up of the circuit, and shows the itemized and total load.

Changes are made by ruling off and carrying forward, and when too badly cut up transfer to clean page. In book form the entire history of a circuit is on record.

Incandescent or Power Register (no form). — Outside of the regular customers' list, contract record, and for alternating circuits the "Transformer Register" (Form No. 22), there is very little use trying to do with anything but a good map. The lines should be well laid out on maps drawn to large scale, and in case of underground lines should give the exact location of all boxes, joints, or other connections; locating them by giving the distance from curb, and direction and distance from the extension of the nearest building-line. For overhead lines the connections from circuit to buildings are plainly marked on the map, stating the house number at end of connection.

Transformer Register (Form No. 22).—Each transformer as it is sent out of the station should be numbered in a conspicuous manner with a good-size stencil; it should then be entered, as soon as installed, in the "Transformer Register," together with the name of the first customer cut in on it; the number of lamps wired, with the name of maker; and the capacity. Should other customers be cut in on the same transformer later on, the name and number of lamps wired only will need entering. The

ARC.

FORM No. 15.

BLANK ELECTRIC LIGHT AND POWER COMPANY.

.....189....

.....Supt.

The following named material and labor has been used at [removed from] the premises of

.....

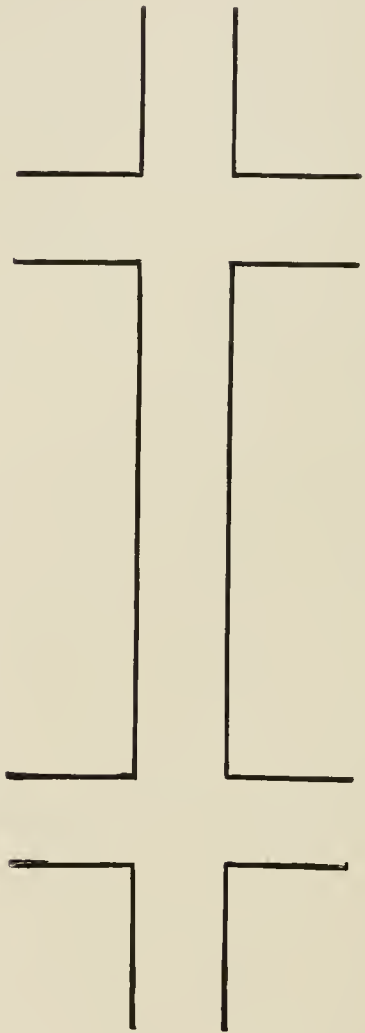
No.....St., as per your Work-order No....

Quantities approved,

.....Storekeeper.....Foreman.

Material.	Quan- tity.	Price.	Amount	Material.	Quan- tity.	Price.	Amount
Arc-lamps: single, double				Amount brought for-			
Series lamps, candle-				ward.....			
power				Wire.....			
Hoods.....						
Globes.....						
Hanger-boards.....						
Spark-arresters.....						
Shades.....						
Series socket and board						
complete.							
Outrigger or fixture.....							
Arc cut-out.....							
Poles....							
Poles....							
Cross-arms, pins							
Pole-steps.....							
Cross-arm braces and bolts							
Mast-arms. .							
.....							
.....							
Total property.				Total material..			
Pins or brackets.....				Labor.			
Brown's pins.....				[Names of Men].	Hours.	Rate.	
Glass insulators.....							
Floor insulators.....				Foreman.....			
Porcelain insulators.....						
Porcelain circuit-breakers						
Rope.....						
Pulleys, number of						
sheaves			
Tubing.....						
Tape, kind			
Solder.....						
Screw-eyes.....				Truck.....			
Lag-screws							
Screws.				Total labor			
Amount forward.....				Total cost.....			

Locate connection on the diagram on the back of this.



INCANDESCENT.

FORM No. 16.

BLANK ELECTRIC LIGHT AND POWER COMPANY.

.....189....

.....Supt.

The following named material and labor has been used at [removed from] the premises of

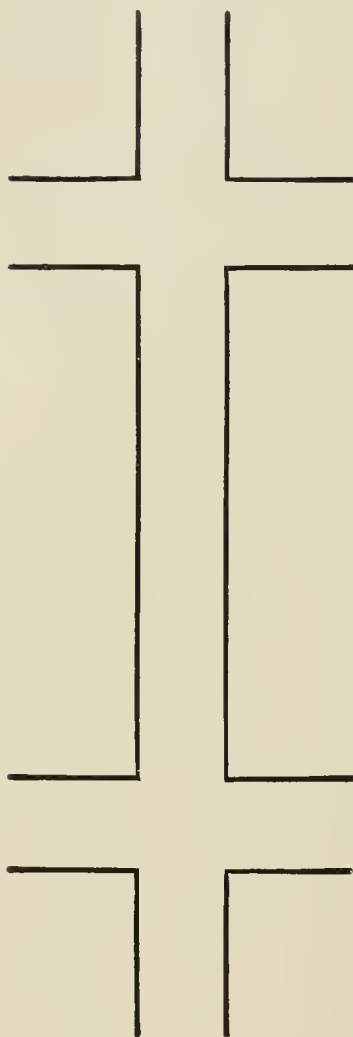
No. St., as per your Work-order No.

Quantities approved,

.....Storekeeper.Foreman.

Material.	Quan- tity.	Price.	Amount	Material.	Quan- tity.	Price.	Amount.
Incandescent lamps.....				Wire....			
Sockets: key, keyless, wall.....				Silk cord, No.			
Wall-plugs.....				Cotton cord....			
Main cut-outs, location				Cleats....			
Branch blocks.....				Moulding.			
Chandelier cut-outs.				Screws.....			
Rosette cut-outs, style				Nails.....			
Main switches.....				Solder.			
Branch switches.				Resin or acid.			
Gas-spars.....				Tape.....			
Shades.....				Tubing....			
Shade-holders.....				Rubber bushings: hard, soft.....			
Electrolier fixtures and brackets (see bill)....				Insulating - joints, style			
Meter No.				Adjustable balls....			
Capacity amperes.				Floor insulators			
Factor.....				Putty.....			
.....				Charcoal.....			
.....				Lumber....			
.....				Paint.....			
.....				Fuse.....			
Total property.....				Total material..			
REMARKS.				Labor.			
.....				[Names of Men.]	Hours.	Rate.	
.....				Foreman.....			
.....						
.....						
.....						
.....						
.....						
.....				Truck.....			
.....						
.....				Total labor.....			
.....				Total cost.....			
.....							

Locate connection on the diagram on the back of this.



TRANSFORMER.

FORM No. 17.

BLANK ELECTRIC LIGHT AND POWER COMPANY.

.....189....

.....Supt.

The following named material and labor has been used at [removed from] the premises of

No..... St., as per your Work-order No....

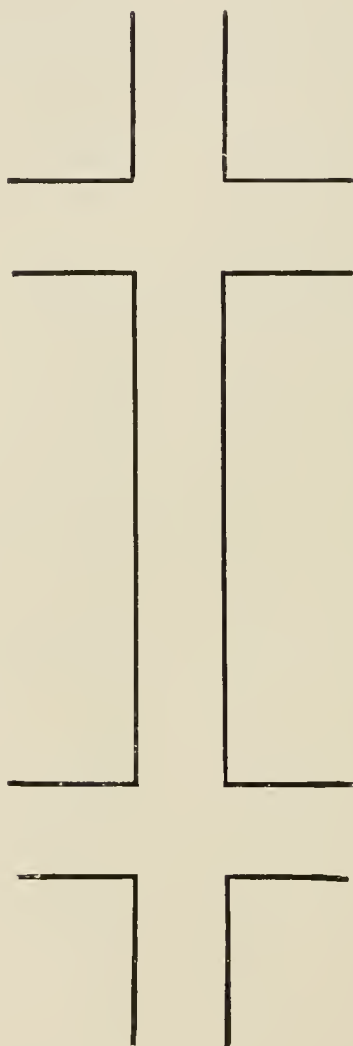
Quantities approved,

.....Storekeeper.Foreman.

Material.	Quan- tity.	Price.	Amount	Material.	Quan- tity.	Price.	Amount
Transformer, type				Amount brought for			
Capacity				ward.....			
Transformer-irons..				Glass insulators			
Transformer-box..				Porcelain insulators			
Primary switch, type				Porcelain circuit -			
Poles....				breakers.....			
Poles.....				Tree insulators.....			
Cross-arms				Pins and brackets...			
Pole-steps.....				Tape.....			
Lag-screws.....				Solder.....			
Cross-arm braces and bolts				Screw-eyes.			
Break-arms				Lag-screws.....			
Paint.....				Screws.....			
.....				Nails.....			
.....				Spike... ..			
.....				Wall-brackets.....			
.....				Fuse.....			
Total property.....				Total material..			
Wire.....				Labor.			
.....				[Names of Men.]	Hours.	Rate.	
.....				Foreman.....			
.....						
.....				Truck.....			
.....				Total labor.....			
.....				Total cost			
Amount forward.....							

Locate connection on the diagram on the back of this.





MOTORS.

FORM No. 18.

BLANK ELECTRIC LIGHT AND POWER COMPANY.

..... 189....

.....Supt.

The following named material and labor has been used at [removed from] the premises of

.....

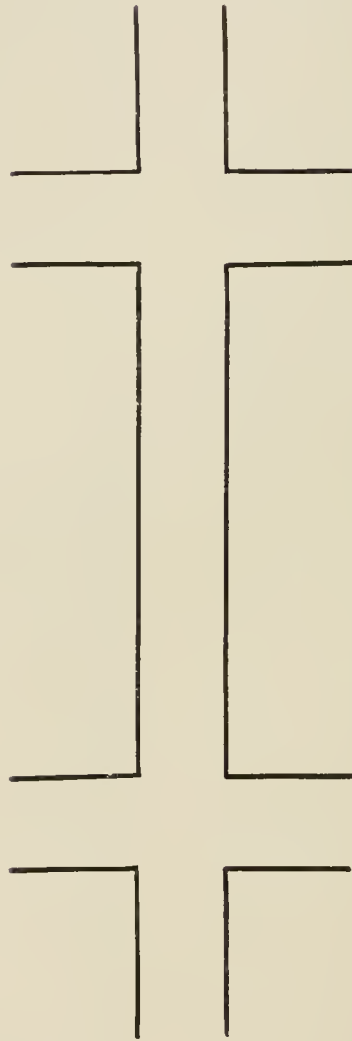
No.St., as per your Work-order No... ..

Quantities approved,

.....Storekeeper.Foreman.

Material.	Quan- tity.	Price.	Amount	Material.	Quan- tity.	Price.	Amount
Motor, type :				Wire.....			
Constant-current }				Pins and brackets ..			
Constant-voltage }				Glass insulators			
Horse-power				Porcelain insulators			
Voltage				Porcelain circuit -			
Amperes				breakers.....			
Maximum current				Tubing.			
Maximum voltage				Tape.....			
Maker's name				Solder.....			
Main switch.....				Screws.....			
Location				Nails.....			
Main fuse-box.....				Lag-screws.....			
Location				Total material..			
Capacity							
Volt-meter.....				Labor.			
Ampere-meter....				[Names of Men]	Hours.	Rate.	
Meter No... ..							
Capacity				Foreman			
Factor						
Location				Truck			
.....							
.....				Total labor.....			
Total property.....				Total cost			

Locate connection on the diagram on the back of this.



SUBSIDIARY CONNECTION.

FORM No. 25.

BLANK ELECTRIC LIGHT AND POWER COMPANY.

..... 189 ..

.....Supt.

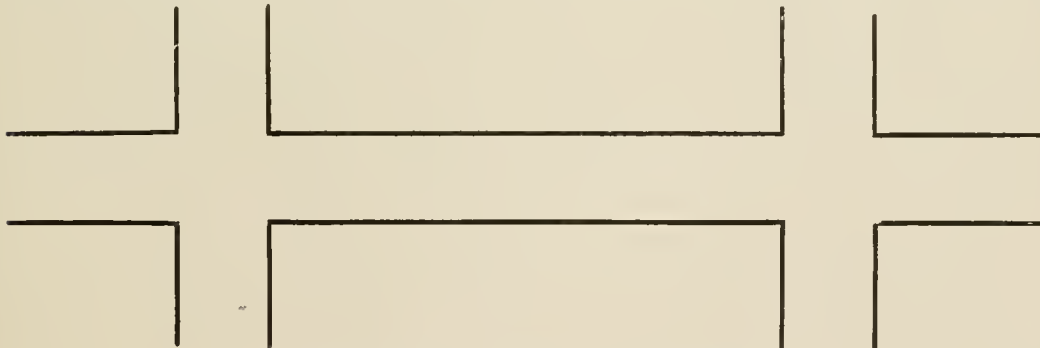
The following named material and labor has been used at [removed from] the premises of

No. St., as per your Order No.

Quantities approved,

.....Storekeeper. Foreman.

Material.	Quantity.	Price.	Amount.	Labor. [Names of Men.]	Hours.	Rate.	Amount
Cable, type				Foreman.....			
Gauge number				Jointer			
Joint-insulation....				Plumber... ..			
Sleeve-joints, copper..						
Sleeve-joints, lead.....						
T-joints, copper			
T-joints, lead.....						
Solder.....			
Primary fuse-box.....						
Location				Truck.			
Primary switch.... ..				Total labor			
Location				Total cost.....			
Total material.....							



Locate the connection on this diagram.

NOTE.—Convenient size, 8" x 10", in pads.

FORM No. 19.

POLE REGISTER.

..... St., commencing at.. ..

Pole No.	Location.	Date Erected.	Height in Feet.	Kind of Wood.	Number and Description of Cross-arms or Other Attachments.	Number and Description of Wires Carried.	Distance to and Number of Next Pole.			
							North	East	South	West

NOTE.—Convenient size page, 12" wide, with 21 lines, in books, half bound, cloth.

FORM No. 20.
LINE REGISTER.

NOTE.—Book folds here ; this page same size as upper page.

NOTE.—Draw full line over dotted line for all cross-arms on pole, to take in as many pins as the cross-arm holds ; drawing line across the pole if the arm is on the side toward you, and filling out line of pole if the arm is on opposite side.

Pole No..... on..... Street.
Facing..... on..... Street.

FORM No. 21.

ARC-CIRCUIT REGISTER.

Starting at station, positive runs to.....to.....
to.....to.....to.....to.....
to.....to.....to.....to.....
to.....to.....to.....to.....

Circuit No.....
Make of wire.....
Gauge of wire.....
Total length.....ft.

Location of Installation.	7 Nights.						6 Nights.						Saturdays or One Night Only.						Total.		
	All Day.	All Night.	.....P.M.	.....P.M.	.....A.M.	Motors.	All Day.	All Night.	.....P.M.	.....P.M.	.....A.M.	Motors.	All Day.	All Night.	.....P.M.	.....P.M.	.....A.M.	Motors.	Lamps.	Motors.	
																				No.	H.P.
						No. H.P.						No. H.P.									

NOTE.—Convenient size, 8" high, 10" wide, in books, loose bound

location should be explicitly stated, such as, "on pole in front [or back] of No. Street," or "on side-wall of building," "in tower," etc. Transformers should be numbered consecutively and entered under the proper *feeder* or circuit number. An index to the location of each number will be necessary when a great many transformers are in use.

This record also furnishes a good inventory of transformers and lights, and will be found otherwise convenient for reference.

FORM No. 22.

TRANSFORMER REGISTER.

Circuit or Feeder No.....

Name of Consumer.	Location of Trans- former.	Number of Trans- former.	Transformer Capacity in 16-c.p. Lamps.										Lamps Wired on Each Transformer.							
			5	10	15	20	25	30	40	50			10	16	20	25	32	50		

NOTE.—Convenient size, 12" wide, 26 lines, in books, half bound, cloth.

Repair Tag (Form No. 23).—This is to be fastened to any arc-lamp or transformer that is brought in from the circuit for repairs, and is useful in tracing the trouble and cost of repair. Similar tags are very convenient for attaching to motors or any other piece of apparatus brought in for repairs.

FORM No. 23.

	<i>Sgl.</i>	<i>Dbl.</i>
<i>Lamp [Transformer] No.....</i>		
<i>Taken in.....189</i>		
<i>From.....</i>		
<i>No.....Street.</i>		
<i>Circuit No.....</i>		
<i>Trimmer.....</i>		
<i>Inspector... ..</i>		
<i>Why returned :.....</i>		
<i>.....</i>		
<i>Work-order No.....</i>		
<i>Repaired by.....</i>		
<i>Turned in to storekeeper</i>		
<i>.....189</i>		

Cable Foreman's Report (Form No. 24).—This blank is to be used by foremen on cable or underground-line work in the same manner as No. 12 is used for pole-lines.

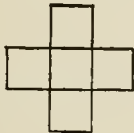
FORM No. 24.

BLANK ELECTRIC LIGHT AND POWER COMPANY.

Order No..... REPORT OF CABLE FOREMAN.

Weather at 12 o'clock noon189 ...

No. Feet Cable Drawn In or Out.	B. & S. Gauge.	Type of In- sulation.	Cable- circuit Number.	Location. [On what Street or Avenue.]	Side of Street.	Number Joints Made.	Name of Insulator.	Name of Plumber.

 DIAGRAM OF MANHOLE. Show on this diagram location of all cables drawn in or out.	EMPLOYÉ'S RECORD.				REMARKS.
	No.				
	...Foreman.....	hours @...			
	...Men ...	" "			
	...Men ...	" "			
	...Men ...	" "			
	...Insulators.....	" "			
	... Plumbers.....	" "			
	... Inspectors.	" "			
	... Trucks.....	" "			
	" "			

Signed.....Foreman.

NOTE.—Convenient size, 8" x 10", in pads.

Conduit Records (Forms Nos. 26, 27, 28, 29).—These records are of two general styles, according as the conduits are rented from a conduit company or owned by the lighting company itself. The above forms are samples of books differing but slightly from those used by a large lighting company in New York City, Nos. 26 and 28 being exact copies following the regular order or routine as required and practised by the Consolidated Telegraph & Electrical Subway Company; Nos. 27 and 29 include the changes necessary to fit them to the uses of companies owning their own conduits.

These books seem to cover the entire ground very thoroughly, and to include all the items and data necessary for a complete record.

Application blanks printed in copying-ink are supplied by the Subway Company for the rental of a duct, for the construction of a subsidiary duct, and for privilege to withdraw cables.

In using the book shown in Form No. 26 an application for a duct is made out on one of the blanks above mentioned, copied into a subway application book, and forwarded to the main office of the company.

The date and record folio of this being entered in the first two columns of this form. The Subway Company, after completing all the financial formalities, assigns the duct to the company, stating its position in the manhole, length, diameter, and any other necessary data. The Subway Company also furnishes a large map of the city showing the location of all conduits and giving the distances between manhole centres. These papers from the Subway Company furnish all the data for filling out the remaining columns on the first page of No. 26. The wide horizontal space between the two rulings is for laying out the number and gauge of cables drawn into the conduit duct, as per the data furnished on the opposite page.

The figure at the left of this wide space is a diagram of the interior of a manhole, and the exact position of the duct should be laid out on the proper side of the diagram.

The right-hand page of this book is a record of the main cables drawn into the duct assigned, as shown on the first page. The headings are thought to be sufficiently plain to indicate their uses. "From," "To" mean *from* a street *to* another street, the names of which should be given; and if *from* the middle of a block or *to* a similar point, it should be specified distinctly. As cables are sometimes drawn in by contractors and sometimes by the company itself, the column "By Whom" is necessary in order to determine responsibility for faults developing afterwards. When conduits are owned by the lighting company itself, Form No. 27 should be substituted for the first page of No. 26.

Form No. 28 is a record of subsidiary connections from the main conduit to buildings, the first page being for the pipe or conduit connection, and the second page for the cables drawn into it.

The first page of this form is also filled from blanks and bills furnished by the Subway Company.

Tracings of the large street section-maps, showing the line of all conduits and subsidiary connections, are also furnished when required.

The subsidiary connections are copied from these section-

FORM No. 28.
RECORD OF SUBSIDIARY PIPE-CONNECTIONS.

[Left-hand page.]

Date Applied for,	Applica-tion book Folio,	Date Com-pleted,	Plan of Construction.	From	To	Pipe. Ft. Size.	Bends. No. Size.	Boxes. No. Size, Type.	Total Cost of Subsidiary Connection.	Date of Bill. Mo. Day. Y'r.	Remarks.

FORM No. 28A.
RECORD OF SUBSIDIARY CABLE-CONNECTIONS.

[Right-hand page]

Date and Num-ber of Work-order.	Name.	Address.	Feet of Cable.		Date Drawn In.	Date Connect-ed.	Connected to Cable No.	Kind of Ser-vice.	Insulation.	Location of Primary Switches.	Total Cost of Subsidiary Cable.	Repairs and Maintenance.	Costs.	Remarks.
			Size of Gauge, B. & S.											

NOTE.—Convenient size page, 18" wide by 20" high.

maps onto the small block-sections in the book, and the streets adjacent are lettered in.

The right-hand page of No. 28 (No. 28A) is filled out from data supplied by the "Work-order" given for the job, with the returns from the different foremen.

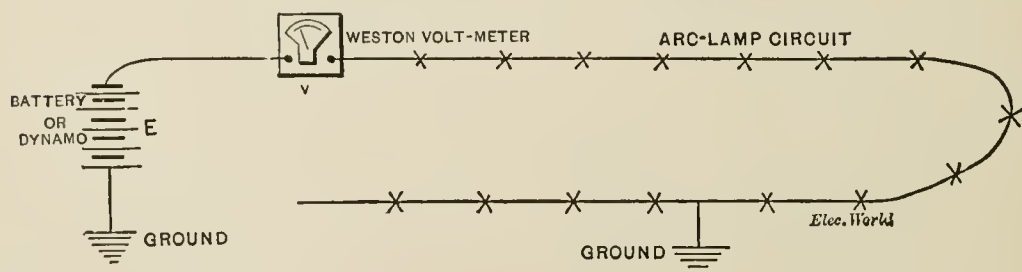
Form No. 29 is to take the place of the previous one with companies owning the conduits themselves. All the headings are thought to be sufficiently clear to explain their uses.

A thorough and complete set of maps should accompany any system of records of underground work, and all box and joint locations should be very carefully and accurately laid out. All hidden joints or connections to buildings should be located by giving the distance from the curb and the distance either way from the extension of the nearest house partition-line. Distances between centres of all manholes, hand-hole boxes, or, as in the Edison system of tubing, between joints, should be plotted exactly.

The sizes of pipe or other conduit, the nature of the material, depth below the surface, and in fact any particular data connected with the conduit system should be stated on the face of these maps. Sizes and style of cable are also well to state on the maps after completion.

Circuit-testing Report (Form No. 30).—This form is used for recording the routine tests of circuits made during the day. These tests are usually made by magneto-bell, no attempt being made to measure the insulation resistance. Tests on live lines of any kind are rarely made at present, but it is high time they were, as the methods are simple and quick. Below are given methods for series arc and parallel circuits by use of the Weston voltmeter.

a. Series Circuit; Dead.



E = E. M. F. of battery;

v = reading in volts of Weston voltmeter;

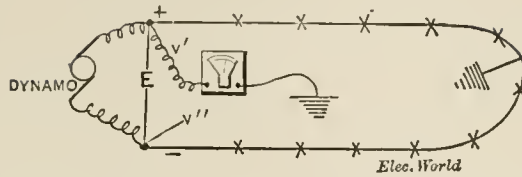
R = resistance of Weston voltmeter;

x = insulation resistance to ground.

Then

$$x = R \times \frac{E - v}{v}.$$

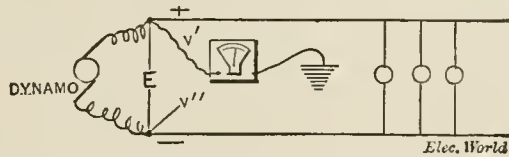
b. Series Circuit; Live.



First take reading of full voltage E , then take voltage of v' and of v'' to earth. Letters represent same items as first case. Then

$$x = \frac{R}{v' + v''} \times (E - (v' + v'')).$$

c. Parallel Circuits; Live. Two-wire only.



Take total voltage E , then voltage from $+$ side to earth, then voltage from $-$ side to earth. Letters same as other cases.

$$\text{Positive side, } x = R \times \left(\frac{E - (v' + v'')}{v'} \right);$$

$$\text{Negative side, } x' = R \times \left(\frac{E - (v' + v'')}{v''} \right).$$

For case " c " the Weston Company now make a volt-meter with a zero mark in the centre of the dial and a circuit-closing

FORM No. 30.

BLANK ELECTRIC LIGHT COMPANY.

No.

.....189....

CIRCUIT-TESTING REPORT.

Mention only those circuits that test defective.

Time.	Trouble, and Time Removed.	Insulation Resistance.
	Weather	
	Weather	
	Weather	

All circuits not showing an insulation resistance of megohms or over to be considered defective.

REMARKS.

.....

Signed.....Inspector.

NOTE.—Convenient size, 5'' wide by 7'' high.

plug on either side, which much facilitate readings, and used with a chart furnished for the purpose, the measurement of line-insulation is very simple. As mentioned above, in the routine tests it is not necessary to make record of any but those circuits showing insulation below the standard. If special record tests are made periodically, report should be made on Form No. 31 for cables and a similar one for pole-lines, for it is necessary to know all the conditions in order to correctly judge results.

Underground-cable-test Report (Form No. 31).—This form is for use to record all tests of insulation on underground cables where such tests are made on *dead* circuits and by galvanometer and battery. This test is usually the one required by conduit authorities, but that shown in the previous paragraph, in which the voltage actually used on the circuit is also used for testing, is considered far more preferable by the writer.

This form can be made up in books or in sheets according to individual taste; if in the former manner it is well to leave out

FORM No. 31.

INSULATION TEST OF THE UNDERGROUND CABLES OF THE BLANK
ELECTRIC LIGHT AND POWER COMPANY.

Circuit No..... Made at....
[Left-hand side.]

Date of Test. mo. day	Hour of Test.	Weather.	Temperature.	Number of Circuit.	Type of Cable.	B. & S. Gauge of Conductor.	Location in Conduit.				E.M.F. of Testing-battery.	Constant of Galvanometer.	Deflection of Galvanometer. Divisions
							Street or Avenue.	Which Side.	From	To			

[Right-hand side.]

Total Insulation Resistance. Megohms	Insulation Resistance per Mile. Megohms	Insulation Resistance per Mile. Required by Rules without Lamps or Inside Connections.	Length of Cable in Circuit. Miles	Number of Converters in Circuit.	Length of Overhead Wire in Circuit. Miles	Number of Lamps in Circuit.	Earth-current. Deflection. Divisions	Capacity of Cable. Charge. Divisions	Location of Testing-place.	Remarks.

NOTE.—Convenient size page, 8'' × 10½''.



the column headed "Circuit Number" and head the page with the same, for then all tests of the same circuit are recorded under each other, and comparisons are easier made. Sheets are required in case a report has to be submitted to a conduit company or the city authorities.

Complaints (Form No. 32).—This form is for use in the office for complaints received from customers either verbally or by telephone. The word "messenger" or "telephone" is crossed out according as to how the complaint is received. The slip is to be filed away by date when remedied.

The method of recording complaints practiced in some stations is to keep a complaint and repair book on some convenient desk, in which are entered complaints as they come in, stating time and how received; and such petty orders for immediate repairs as require no material are attended to by the regular inspectors. The first man in takes off such items as he can conveniently visit, setting his name and time taken opposite each item, and checking off when completed, again stating the time. This is a very convenient method, and the history of repairs is before one in good form. One of the large office diaries procurable at stationers' is a convenient form of book for this purpose.

FORM No. 32.

Dated.189....

Mr.

of No.Street,

complains ato'clock ...M., by telephone, that.....
messenger,

.....

.....

.....

.....

Remedied satisfactorily.....189...

ato'clock ...M. Signed.

NOTE.—Convenient size, 3" × 4½".

Inspector's Report (Form No. 33).—This blank is for use by the men who patrol the circuits during service and by trimmers in reporting any fault discovered. It is for general use on all

kinds of service, and is especially useful in reporting street arc-lights out, this being checked by the reports from city authorities.

If the note on the bottom, stating that lights out or trouble not properly reported will be charged to the inspector, is carefully impressed, much expense may be saved.

Inspectors have been known not to go entirely over the lines: in such cases charging them with the price of the lamps in trouble once or twice will bring them to time.

FORM No. 33.

BLANK ELECTRIC LIGHT AND POWER COMPANY.

INSPECTOR'S REPORT: from.....o'clock.....M. to..... o'clock.....M.

Weather at midnight Date.....189....

LIGHTS OUT OF ORDER.

Location of Lamp, or Name of Customer.	Time Reported Out.	Time O.K.	Total Time Out of Order.	Trouble.

Signed..... Inspector.

Lamps out, or trouble, not properly reported will be charged to the Inspector.

NOTE.—Convenient size, 7" x 8".

Engineer's Daily Report (Form No. 34).—This blank is for use in small stations where it is considered unnecessary to have separate blanks for the operating departments. It is thought to cover most of the points necessary, and can be called either Engineer's or Superintendent's Report as desired.

Although space is provided on this blank for the regular supplies, the writer is much in favor of keeping such record entirely separate from operating reports and including it in the storekeeper's periodical report.

In ruling this blank, space must be provided for according to the equipment of the station.

Dynamo-engineer's Report (Form No. 35).—This form is for use by the man in charge of the dynamo-room, in those stations that are large enough to require separate departmental reports. No supplies are provided for, as they are reported by the storekeeper.

ENGINEER'S DAILY REPORT.

Weather at 6 P.M. 189 . . .

[illegible]

Total ampere-hours.....	equal to.....	16-c.p. lamp hours.
Highest amperes.....	“	16-c.p. lamps.
Lowest amperes.....	“	16-c.p. lamps.
Average amperes.....	“	16-c.p. lamps.
City arc-lamps connected, No.	
Commercial arc-lamps connected, No.	
Series lamps connected, No.	
Constant-current motors connected.	{ No.	
	{ Horse-power	
Total arc-lamp hours, arc-circuits	
Total load equal to.....	arc-lamp hours.

Name.	Occupation.	Reported.	Off Duty.	Hours Employed.	Rate.

Signed.....Engineer.

NOTE.—Convenient size, 8'' × 15''.

FORM No. 35.

BLANK ELECTRIC LIGHT AND POWER COMPANY.

DYNAMO-ENGINEER'S DAILY REPORT.

Weather at 6 P.M.....189....

Number of Dynamo.	Number of Circuit.					Time Started.	Time Stopped.	Number of Hours Stopped for Trouble.	Total Hours' Run of Dynamo.	Remarks.

EMPLOYÉS' RECORD.

Day-tour from. ... A.M. to .....P.M.			Night-tour from,.....P.M. to.....A.M.		
Name.	Occupation.	Hours.	Name.	Occupation.	Hours

.....
.....
.....

Signed.....Dynamo-engineer.

NOTE.—Convenient size, 8" x 10".

Chief Engineer's Daily Report (Form No. 36).—This blank is made up for large stations using generally more than one shift of employés. The form here shown is ruled for two shifts; in case three shifts are used it is only necessary to widen out the blank to include the third tour.

In ruling the blank for a station, spaces for names, boilers, engines, etc., will be provided to fit the case. The form is sufficiently indicated.

Chief Gateman's Report (Form No. 37).—Where water-power is used exclusively, or in fact at all, and separate departmental reports are required, this form includes about all the data necessary.

Should the station be small and separate reports not be kept, the main part of the data can be put on the daily report of engineer or superintendent (Form No. 34) in place of steam data.

Superintendent's Daily Report (Form No. 38).—This is a *résumé* of the other departmental reports, such as Chief Engineer's Daily Report, Dynamo-engineer's Report, Inspector's Reports,

FORM No. 36.

BLANK ELECTRIC LIGHT AND POWER COMPANY.

CHIEF ENGINEER'S REPORT.

For 24 hours ending 7 A.M. 189....

Day-tour.						Night-tour.					
Names.		From.....A.M. to.....P.M.				Names.		From.....P.M. to.....A.M.			
.....Chief Engineer, hours.....						.....Assistant Engineer, hours.....					
.....Assistant " ".....						.....Oiler, ".....					
.....Oiler, ".....						.....Fireman, ".....					
.....Fireman, ".....					" ".....					
....." ".....											
						Water-meter.					
						7 A.M. To-day.		Previous Reading.		Amount Used, Cu. Ft.	
Coal, kind.....						Temp. feed-water.....degs. average.					
Amount used.....lbs.						Temp. hot well....." "					
Other fuel reduced to coal *....."						Evaporation... lbs. water per lb. coal.					
Total fuel....."						Quarts Eng.-oil.		Quarts Cyl.-oil.		Lbs. Grease.	
Ashes removed....."										Lbs. Waste.	
Combustible consumed....."										Rags.	
Engines.						Boilers.					
No. Engine.	Time Started.	Time Stopped.	Hours Run.	Average I.H.P.	Average Vacuum, Inches.	No. Boiler.	Time Started.	Time Stopped.	Hours Run.	Average Pressure.	Temp. Uptake.

REMARKS.

.....

.....

.....

Signed..... Chief Engineer.

* Multiply weight of wood by $\frac{4}{10}$ to reduce to coal equivalent.

NOTE.—Convenient size, 6" x 10".

Construction and Installation reports, reports through the office of lights or contracts taken by canvassers, together with the number of employes of each department. Supplies are not included, as they are to be reported periodically by the storekeeper.

As it is unlikely that stations employing a smaller force of men than here indicated will require a separate Superintendent's Report, such stations are referred to Form No. 34 for use in place of this one.

FORM No. 37.

BLANK ELECTRIC LIGHT AND POWER COMPANY.

CHIEF GATEMAN'S DAILY REPORT.

For 24 hours ending 7 A.M. 189....

Day-tour.				Night-tour.			
Names.	From	A.M. to	P.M.	Names.	From	P.M. to	A.M.
.....	Chief Gateman,	hours.	.....	.....	Assistant Gateman,	hours.	.....
.....	Assistant "	"	.....	.....	Oiler,	"	.....
.....	Oiler,	"	.....	.....	Rackman,	"	.....
.....	Rackman,	"	.....			
Height of water on dam.....ft.				Shaft-oil Used, Quarts.	Lbs. Grease Used.	Lbs. Waste Used.	Rags.
Height of water in tail-race....."							
Weather at 6 P.M.....							

Water-wheels.

No. Wheel Used.	Time Started.	Time Stopped.	Hours Run.	Number of hours used.					
				$\frac{1}{4}$ Gate.	$\frac{1}{2}$ Gate.	$\frac{3}{4}$ Gate.	Full Gate.	Average Head for the Period.	

Signed.....Chief Gateman.

NOTE.—Convenient size, 8" x 10".

Output Register, Constant-potential Circuits (Forms Nos. 39 and 40).—There are several methods of recording the output from constant-potential dynamos. The one most generally in use, where any is used, is to register the readings of the current-indicators on each feeder or circuit at short intervals during the service. Total-current indicators are occasionally used, but it is much better to read the output of each feeder in order to be able to locate the heavy loads.

Another method now coming much into use, especially in alternating-current stations, is to use a recording station-meter on each feeder, taking the readings of the dial at the same periods as were those of the current-indicators; it is necessary, of course, to take the difference in the readings to determine the output between readings, but a check is afforded by the fact that the sum of all the differences equals the total difference between the first and last readings.

FORM No. 38.

SUPERINTENDENT'S DAILY REPORT.

For 24 hours ending 7 A.M.189....

No. commercial arc-lamps connected		Started.	Stopped.
No. public arc-lamps connected.....			
No. station arc-lamps connected.....			
No. series lamps connected	Commercial arc-circuits.		
No. incandescent lamps connected	Day arc-circuits..		
No. incandescent lamps equal to 16-candle-	City circuits.		
power lamps connected.....	Motor circuits.....		
No. motors connected.....	Incandescent circuits....		
Total H.P. of motors connected....			
Total load for 24 hours equal to .....arc-		Number of customers connected.....	
lamp hours or kilowatt-hours.			

EMPLOYÉS.

Number.		Number.		Number.
Steam-engineers		Linemen		Canvasser
Oilers		Helpers		Bookkeepers
Firemen		Trucks		Clerks
Dynamo-men		Electrician		Storekeepers
Trimmers		Cashier		Typewriter
Inspectors		Collector		Watchman

TROUBLE.

Name and Location.	Time Reported.	Time O.K.	Total Time Out.	Cause.
New Lights or Motors Cut In.		Lights or Motors Cut Out.		
Name and Location.	Number.	Number.	Name and Location.	Cause.

NEW CONTRACTS TAKEN.

Name.	Location.	Number of	
		Lamps.	Motors.

Signed.....Superintendent.

NOTE.—Convenient size, 8" x 14".

Form No. 39 is made up for the first method and can be ruled with columns enough to accommodate any number of feeders; form No. 40 is for use in the second method: in either case it is well to make from the reports a load diagram on cross-section paper in order to show graphically the way the output is running.

Where alternating current of constant potential is used and half-hourly readings of current-indicator are taken, the following simple rules may be used for expediting calculations or the reduction of the primary amperage to secondary ampere-hours:

If primary is 1000 volts and secondary 50 volts, annex a cipher to the sum of the half-hour readings in amperes.

FORM No. 39.

CONSTANT-POTENTIAL CIRCUITS.

.....189....

Output register for 24 hours ending 6.30 A.M. to-day.

Time	Feeder No.	Feeder No.	Feeder No.	Feeder No.	Feeder No.	Feeder No.	Feeder No.	Feeder No.	Feeder No.	Feeder No.	Totals.	Volts at Station.
7 A.M.												
7.30												
8.00												
etc., at half-hour intervals.												
Totals..												

Highest..... amperes. Lowest.....amperes. Average.....amperes.
Equal to.....16-c.p. lamps. Equal to.....16-c.p. lamps. Equal to.....lamps.
Signed..... Electrician.

FORM No. 40.

CONSTANT-POTENTIAL CIRCUITS.

.....189....

Output register for 24 hours ending 6.30 A.M. to-day.

Time.	Reading of Station Meter.	Difference.	Voltage in Station.
[Last reading.]			
7 A.M.			
7.30			
8.00			
etc., at half-hour intervals.			
Total.....			

Highest difference..... at.....M.
Lowest difference..... at..... M.
Average difference, mean load.....atM.
.....Electrician.

If primary is 2000 volts and secondary 100 volts, the same rule applies.

If primary is 1000 volts and secondary 100 volts, annex the cipher as above, and one-half the amount is the answer.

If primary is 2000 volts and secondary 50 volts, annex the cipher, and twice the amount is the answer.

The reason for the above rules will readily be found by calculating one or two examples by averages in the usual way and taking the ratio of conversion, 20 to 1, 20 to 1, 10 to 1, 40 to 1, for each of the respective cases.

Output Register, Arc-circuits (Form No. 41).—This blank is to be filled up from the daily reports of the dynamo-engineer (Forms Nos. 34 and 35), assisted by the Arc-circuit Register (Form No. 21), containing the record of all load on each circuit; the deductions for trouble are taken from the Inspectors' Reports (No. 33), giving the number and time of lights out. The result is the total output in kilowatts, and reducing to arc-lamp hours furnishes a basis on which the average hours' burning for each arc-lamp can be calculated.

In case two sizes of arc-lamps are in use, say ten-ampere lamps for street use and seven-ampere lamps for commercial customers, it is necessary to reduce the entire output to arc-lamp hours in order to separate the two or more sizes of lamps. As the difference in cost of operating divided and full arc-lamps is scarcely 10 per cent, while the difference in energy required is something like 20 or 30 per cent, it is readily seen that any estimate of cost based on the kilowatt-hours or energy used in cases where both sizes of lamps are in use is decidedly erroneous.

Trimmer's Book (Forms Nos. 42, 43, and 44).—Few stations keep any specific record of trimming arc-lamps, therefore have no "first entry" of burning, taking for granted that the lamp burned unless reported otherwise. Form No. 42 is so devised that it can be made up in a strong pass-book form to be carried by the trimmer, the names being written in by the clerk until the best order is determined and the customers become regular and steady, after which time the names may as well be printed in when the books are made, leaving a few blank lines for subsequent additions.

This form is much the most convenient, though, printed in loose sheets, and only a week's supply folded and placed in a stiff loose cover with a back-band for holding them, some-

FORM No. 41.

DAILY OUTPUT REPORT FOR ARC-CIRCUITS.

.....189

Lamps or Motors.	Watts per Lamp or Motor.	Number Lamps or Motors.	Equivalent in Arc-lamps.	Time Started.	Time Stopped.	Hours Run.	Number of Lamp- hours or Motor- hours out for Trouble.	Total Lamp- hours.	Reduced to Kilo- watt Hours.
Public lamps, arc...									
.....									
.....									
.....									
Commercial arc-									
lamps.....									
.....									
.....									
.....									
Series incandescent									
lamps.....									
.....									
.....									
.....									
Constant - current									
motors.....									
.....									
.....									
.....									
Totals									
	Average hours' burning per arc-lamp								
Signed Superintendent, [or Electrician.]									

what after the style of the Western Union Telegraph messenger case for signature-blank. In this way, at the end of the week the blanks are removed by the clerk and replaced by fresh ones, thus leaving the week's work in the office for transfer to Customers' Ledger, without hindering any one.

Names should be listed in the order that the trimmer visits them, so as to insure that all lamps will be trimmed, and in case the regular trimmer is unable to attend to his work a new man can take the book and locate all the lamps from it.

Another method is shown in Form No. 43, which is a small

FORM No. 43.

Trimmer's Report.

Name.....

Premises No.....Street.

Number of lampsof.....candle-power.

Burn untilo'clocknights for.....months.

Lamps burned week ending.....

Day of Week.	Number of Lamps.	Remarks.
Sunday.....
Monday.....
Tuesday.....
Wednesday.....
Thursday.....
Friday.....
Saturday.....
Totals.....

SignedTrimmer.

NOTE.—Actual size.

page made in loose sheets, and everything can be printed on it if customers are comparatively regular. These sheets are placed in a loose cover of flexible leather and are to be replaced every week, or they may be made to last a month if desired. Pages for new customers can be inserted in consecutive order, so that the trimmer always has a complete list of his lamps, giving full particulars as to how and when they are to burn. At the end of the period for which these slips are made out they are turned in to the office and become the "first entry" and record of the work and of the charge to the customer.

FORM No. 44.

TRIMMERS' REPORT.

No.....

BLANK ELECTRIC LIGHT AND POWER COMPANY.

I hereby acknowledge that the number of arc-lamps stated below have burned to my satisfaction for the time and dates stated below :

.....
[Customer will sign here.]

..... 189....

Day. [Time of Burning.] Date.	Sun- day.	Mon- day.	Tues- day.	Wednes- day.	Thurs- day.	Fri- day.	Satur- day.	No. Days.
Part night to..... P.M.								
All night.....								

Signed Trimmer.

NOTE.—Convenient size, 4" × 5½".

Form No. 44 is very useful for some troublesome customers. It is made up in pads and filled up by the trimmer, being presented to the customer for his signature at the end of the week when the lamps are trimmed; it is then turned in at the office as a receipt for *goods delivered*, and prevents many disagreeable wrangles over lamps out for any cause.

Meter-book (Form No. 46).—The writer considers this form the best meter-book yet devised; it is not original with him, but is similar to one in use by a large gas company. It is printed in separate sheets on a good quality of strong paper, and the loose sheets, after having the name and other data written in by the clerk, are placed in a flexible leather cover for use by the man who takes the meter-readings. New customers' slips are inserted in consecutive order by street numbers, or removed if stopped. When customers are regular and settled down to a steady run

these sheets can all be printed in quantities, as only the name and other data need to be set up; this is scarcely necessary, though, if readings are taken but once a month, as the book will last a year and can then be filed away.

Customers' Bills (Forms Nos. 45, 47, 48, 49).—Forms Nos. 47, 48, and 49 are different styles of bills for different classes of meter service, the last one (No. 49) being printed on the present large-size postal card, and sent out as a statement for the current month, without arrearages, as it is illegal to dun a person by postal card. It has been in very successful use by a large gas company for a long time, and is very convenient where customers pay at the office rather than to a collector.

Form No. 45 is used for arc-lamps, incandescent lamps, or motors on contract service.

The coupons attached to the right-hand end of each of these forms are to be removed by the collector when paid, and serve as a check for his collections at night,—all bills not paid being brought back whole,—so he need make no entry during the day, thus very much facilitating the work.



FORM No. 45.

Contract Customers' Bill.

The Collector is not authorized to change the contract or this bill. Make all complaints in writing to the Manager.

.....per cent discount for cash in.....days from date.

.....189.....

.....No.....Street,

.....No.....Name,

To BLANK ELECTRIC LIGHT AND POWER COMPANY, DR.,

For Electric Current furnished for

.....lamps, from.....to.....at.....

.....motors

Discount for cash.....

Bills rendered.....

Amount due and paid.....

Received payment.....189.....

For the Company.....

Amount \$.....

Discount.....

Arrears.....

Due.....

Date paid,

This coupon to be detached at payment.

NOTE.—Convenient size, 4' x 10'.

Meter Customers' Bill.

The Collector is not authorized to change the contract or this bill. Make all complaints in writing to the Manager.

.....per cent discount for cash in..... days from date.

.....189..No.....Street,

Mr.....No.....

To BLANK ELECTRIC LIGHT AND POWER COMPANY. DR.,

For Electric Current furnished for.....

Present state of meter.....

Previous state of meter.....

Difference.....

Discount for cash.....

Bills rendered.....

Amount due and paid.....

Received payment.....189

For the Company.....

No.....Name,

Amount \$.....

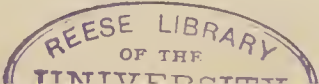
Discount.....

Arrears.....

Date paid.

This coupon to be detached at payment.

NOTE — Convenient size, 4" x 10".



FORM No. 49.

Customers' Postal-card Bill.

Month of. 189 ...	.....189 ...
Name,	
.....	
.....	
Amount.....	.....
Discount.....	.....
.....
Arrears.....	.....
Amount paid.	.....
Date paid,	
This coupon to be detached at payment.	

Month of. 189 ...	.....189 ...
To BLANK ELECTRIC LIGHT AND POWER COMPANY, DR.	
State of meter this date.	
State of meter last date.. ..	
Amount of current supplied. k.w. or amp.-hrs. at.....	.....
Less discount.....	.....
.....
Arrears.....	.....
.....
Received payment .....	.....189....
For the Company .....	.....

NOTE.—Print on large-size postal-card, Name and address go on front side of card.



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